Clavis Stereometriæ:

OR, A

KEY

To the ART of

GAUGING,

With a

SYNOPSIS

OF THE

LAWS of EXCISE.

By W. HUNT, Phylomath.

Bonum quò communius eò melius

Licensed June the 26th 1691.
Robert Midgley.

LONDON:
Printed by *Benj. Motte* for the Author and are to be sold *at the Blue Ball* on the back side of *S. Thomas* Apostle's. 1691.


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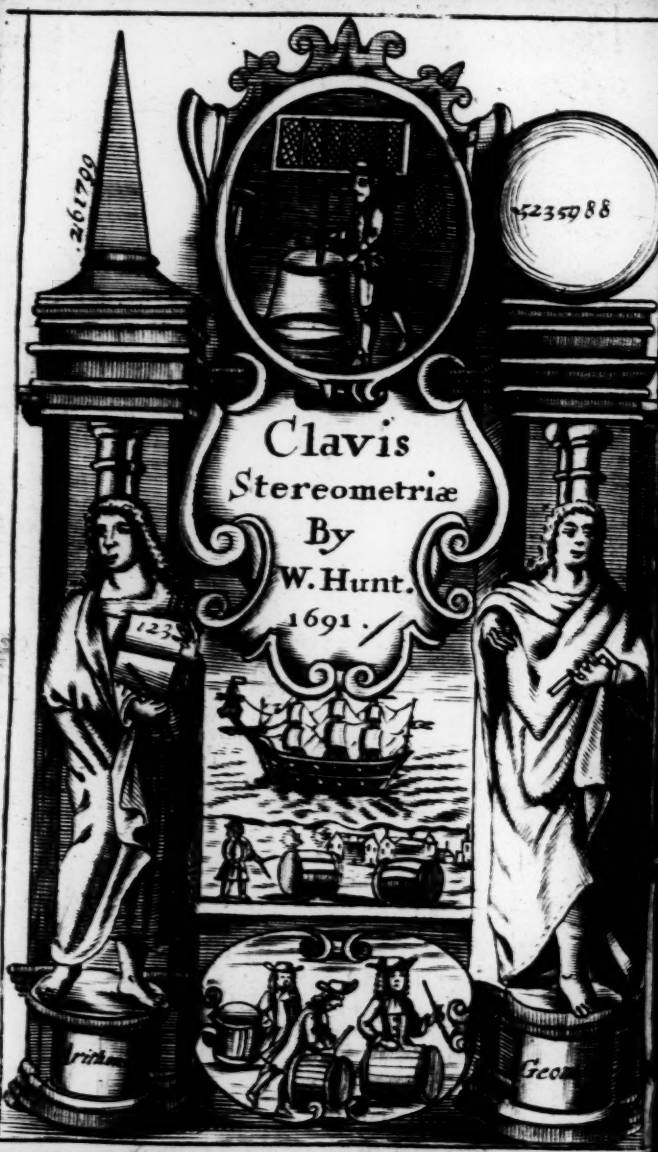

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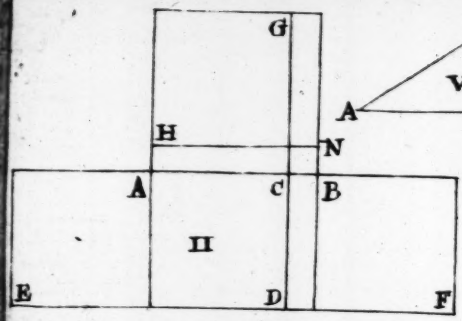
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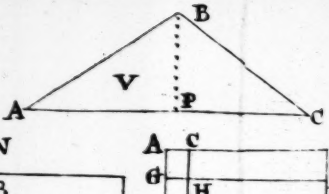
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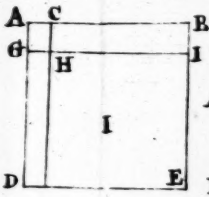
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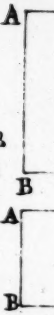
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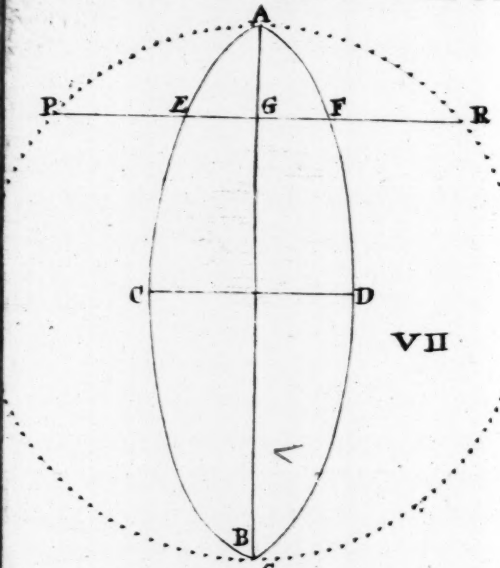
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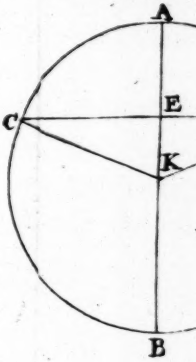
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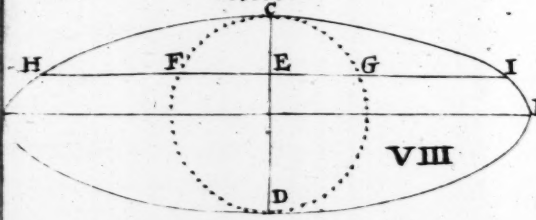
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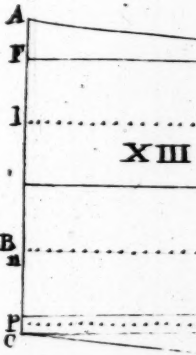
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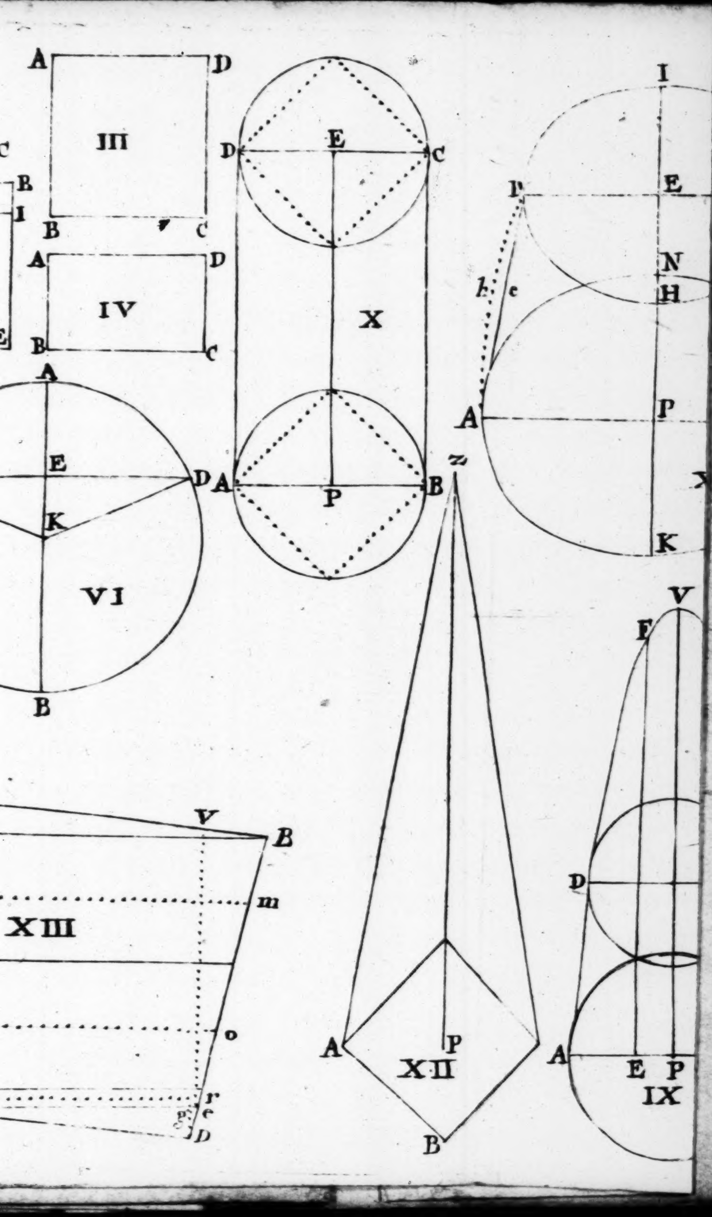

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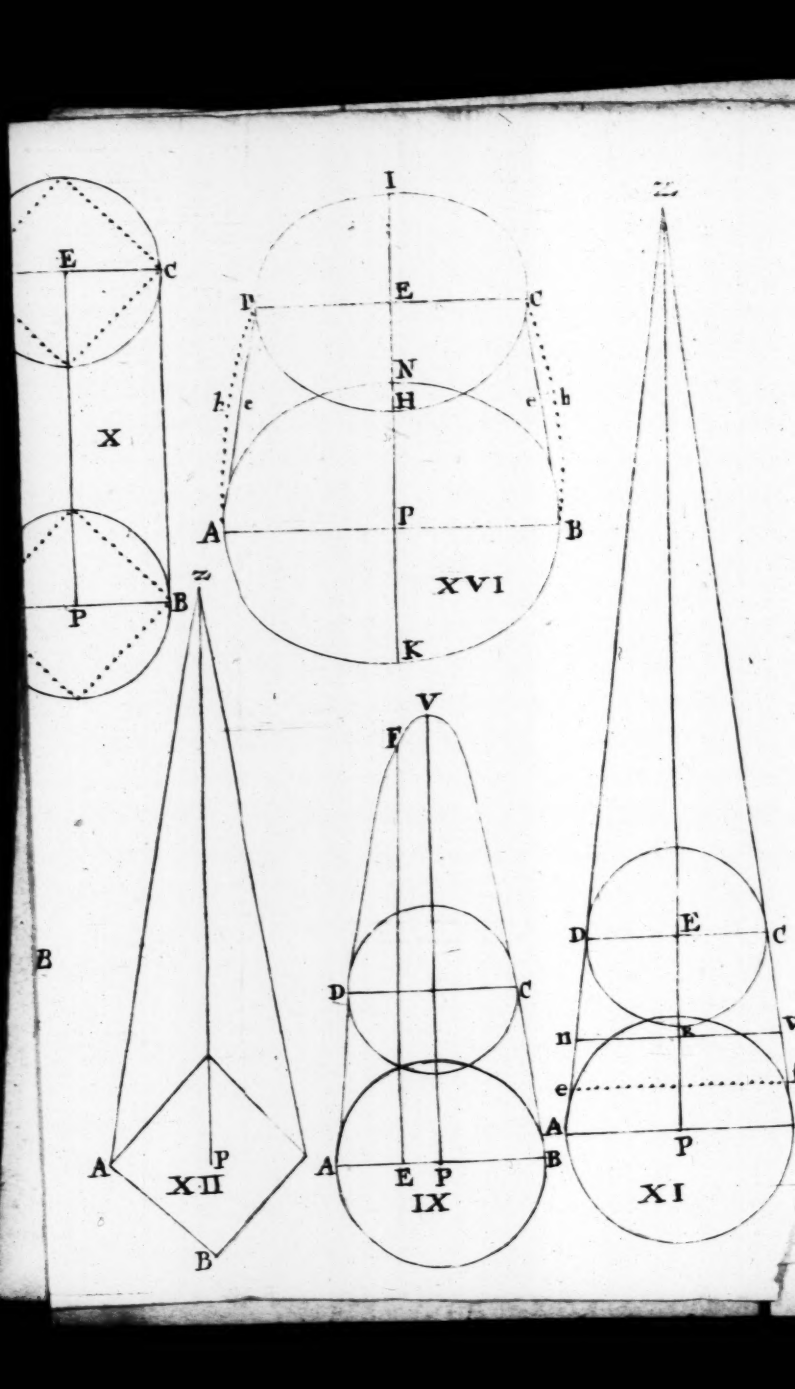
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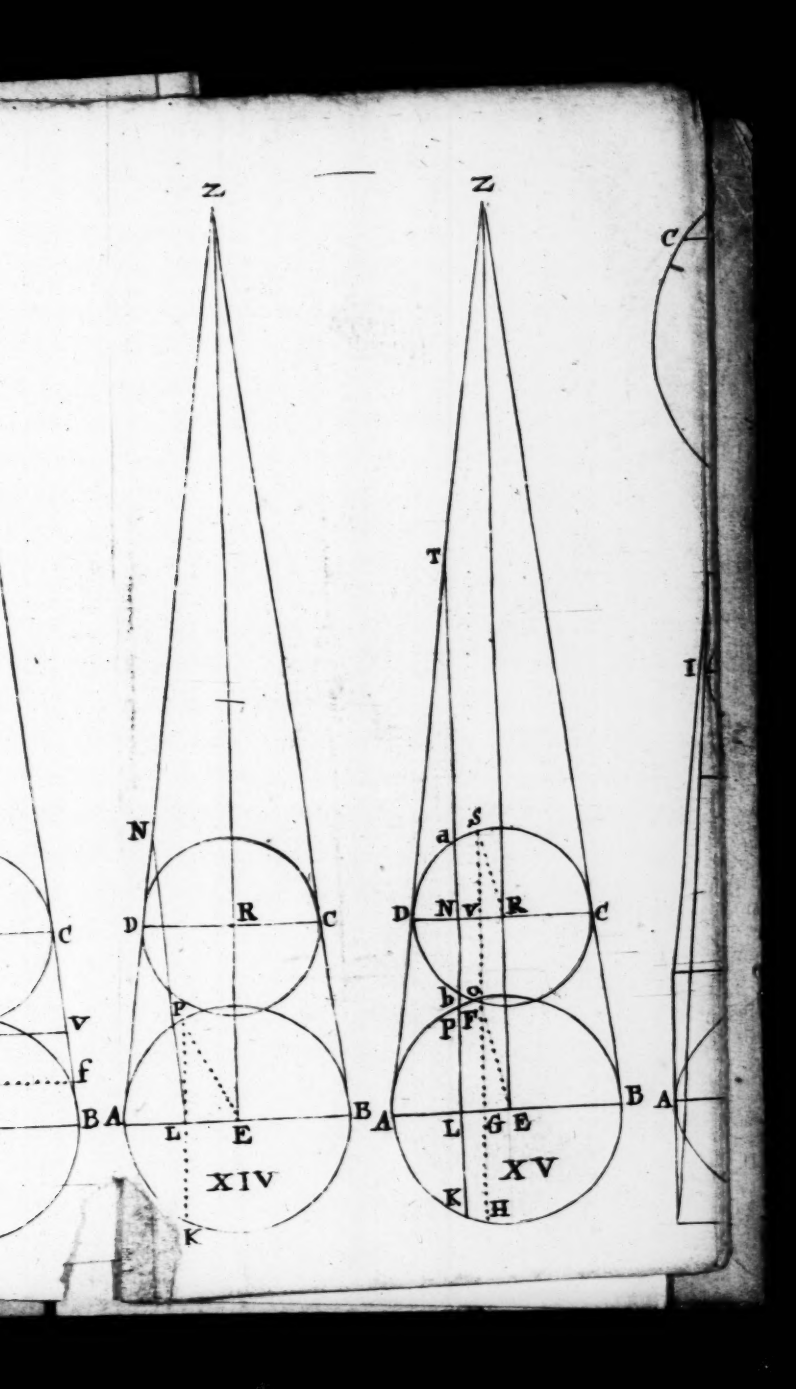
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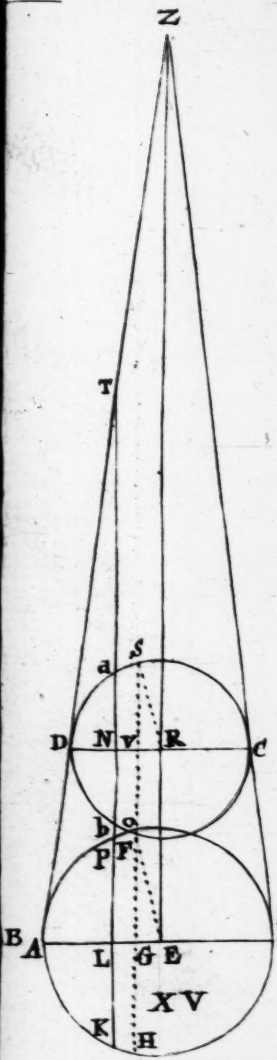
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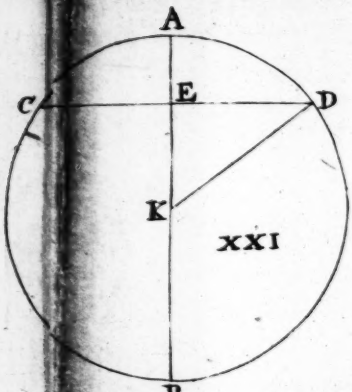
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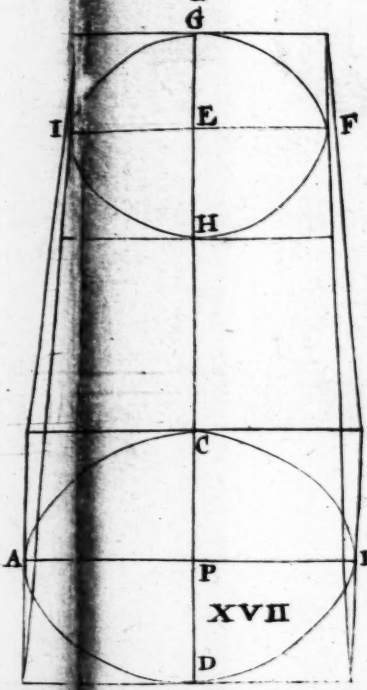
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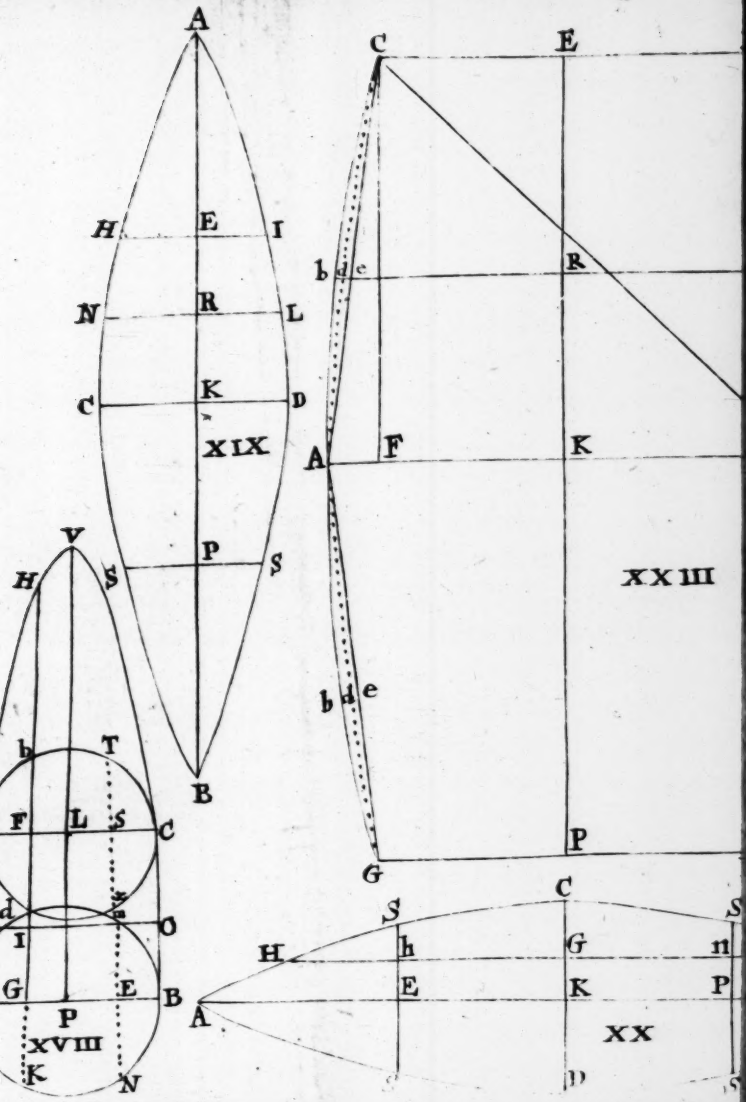
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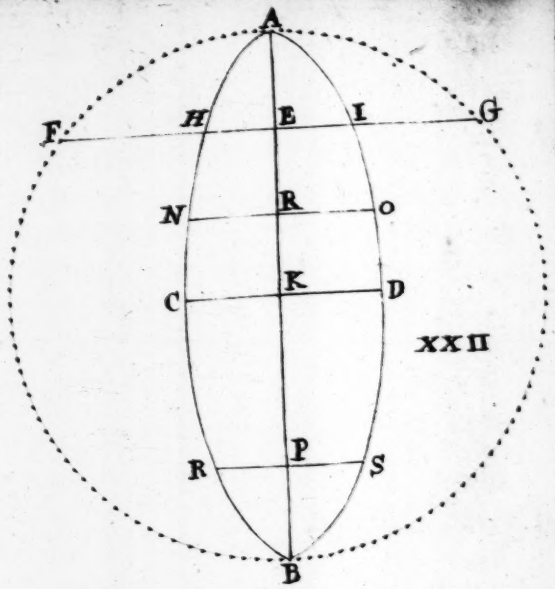
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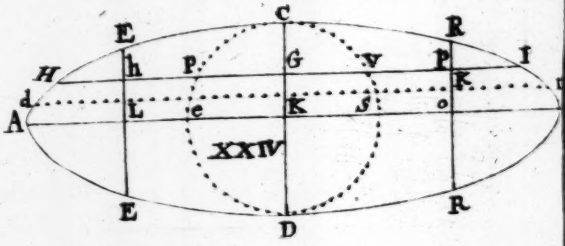
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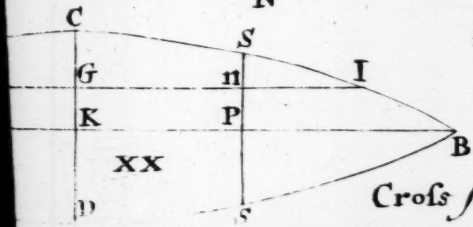
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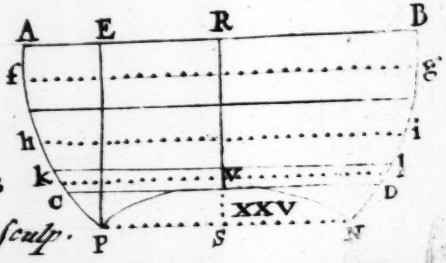
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Crofs *sculp.*

mpliſſimis, prudentiſſimiſque

VIRIS

Henrico Aſhhurſt,
Johanni Morden, } Baronettis.

Samueli Daſhwood,
Humphrido Edwin, } Militibus.
Stephano Evance,

Guilelmo Strong,
Johanni Foche, } Armigeris.
Franciſco Parry,

ectigalium ex Cereviſia, &c, PRÆFECTIS,
Sub auſpiciis Auguſtiſſ. Monarch.
GUILELMI & MARIÆ

HANCCE

CLAVEM Stereometricam

Obſervantiæ & *Gratitudinis* ergò

Summa cum Humilitate, D. D. D.

G. H.

To my BRETHREN the

OFFICERS of *Excise*

Throughout

England and Wales.

THE *Humors and Interests in this critical Age oblige every Author to Circumspection, the least slip of the Pen being a sufficient Warrant to condemn a whole Book, and an Encouragement for every ignorant Pretender to claim the privilege of a Lash.*

I question not, but this small Tract (which may serve an expert Gauger for a Pocket-Companion) will be variously censured, and some perhaps may expect an Apology for its Publication.

I shall only say thus much, that as I dare not justifie it to be free from all exception, so I am not sensible of any fundamental Error, but what Faults may have escaped (which are not unusual in Books of this nature) I desire you kindly to correct.

The Theorems are expresst in Symbols, which neither burden the Memory, nor wrack the Fancy, but plainly represent to the Eye, in a little room, the whole process of the Operation.

That this Clavis *may prove a true* Key *to unlock the Mysteries of this most useful* Art, *is the hearty desire of*

Your Loving Brother,

W. H.

DECIMAL ARITHMETICK.

Notation.

A Decimal Fraction hath its Numerator only expreſt, the Denominator being always an Unit, with as many Cyphers poſtpon'd as there are places in the Numerator; and is ſeparated from the Integer by a Point or Comma; as, the Denominator of .5 is 10; of .15 is 100; of .015 is 1000; and ſo on every Figure or Cypher prepon'd decreaſing its value in a Decuple proportion. Oughtred's *Circles of Proportion*, Pag. 127.

Addition and Subtraction.

Place every Figure under that of the like value, and add or ſubtract, as if all were Integers.

To	32.256	from	37
Add	7.07	ſubtr.	.104
	.7		
Sum-	40.026	Reſts-	36.896

Multiplication.

Multiply the Factors as if all were Integers, and the Decimals in the Product muſt be equal to thoſe in both the Factors; if they are not, ſupply the defect by preponing Cyphers. Dr. Wallis's *Opus Arith.* p. 142.

Factors	1.305	.0375
	6.3	.75
	3915	1875
	7830	2625
Product-	8.2215	.028125

Diviſion.

Having poſtpon'd Cyphers to the Dividend (if need be) divide as if all were Integers; and the firſt Figure in the Quote muſt be of the ſame Denomination with that Figure in the Dividend, which at the firſt demand ſtands exactly over the place of Units in the Diviſor. Dr. Wallis's *Opus Arith.* p. 163.

Or, the Decimals in the Divisor and Quote must be equal to those in the Dividend; if they are not, supply the defect by preponing Cyphers to the Quote.

Divisor. *Dividend.* *Quotient.*

47.3764) 78.0000000 (1.646

3062360
2197760
3027040
184456

Reduction.

A vulgar Fraction is reduced to a Decimal, by postponing Cyphers to the Numerator, and dividing it by the Denominator.

Hence you may make a Factor equal to any Divisor, & con.

For if the Divisor be an Integer, divide an Unit with Cyphers by it; if a vulgar Fraction, divide the Denominator by the Numerator, and the Quote is the Factor.

A *Decimal Fraction* is reduced to a *Vulgar*, by multiplying continually by the next lower Denominator of the Integer, keeping the places of Decimals.

Extraction of the Square-Root.

1. Divide the Number into Periods, by pointing the Units place, and so successively every *second* Figure; because the Square of a single Digit never exceeds two places.

But in Decimals you must point from the Units place towards the Right, and if the places are odd, postpone a Cypher to make them even.

Roots	1	2	3	4	5	6	7	8	9
Squares	1	4	9	16	25	36	49	64	81
Cubes	1	8	27	64	125	216	343	512	729

2. From the first Period towards the Left subtract the greatest Square, and place its Root in the Quote; to the Remainder postpone the next Period, and call it the Resolvend.

3. Double the Quote for a Divisor, and find how often it is contained in all the Figures of the Resolvend, except the last, place the Answer in the Quote, and after the Divisor, and multiply the Divisor with the Figure last added

ded by the laſt Figure in the Quote, ſubtracting the Product from the Reſolvend; to the Remainder poſtpone the next Period for a new Reſolvend, and proceed therewith as with the firſt, repeating this *Rule* till the whole Extraction is ended. Oughtred's *Clavis*, Chap. 23.

```
. . . .
3549456 (1884=Root
28) 254
368) 3094
3764) 15056
.....
```

When the Number is not an exact Square, or Cube, poſtpone Pairs, or Ternaries of Cyphers, and work thus, and you may have what Decimals you pleaſe.

When the preſent Diviſor exceeds its Reſolvend, place a Cypher in the Quote, and after the Diviſor, but in the Cube place two Cyphers after the Diviſor, and poſtponing the next Period, proceed as before.

Demonſtration. 4. 1 2. Fig. 4.

Let AB 12 be cut into two parts, *viz.* AC 2 and CB 10, then:

CBq	=HE=100
AC×CB	=CI=20
AG×GD	=HD=20
ACq	=AH=4

The Sum is the entire Square=AE=144

Extraction of the Cube-Root.

1. Divide the Number into Periods, by pointing the Units place, and ſo ſucceſſively every *third* Figure, becauſe the Cube of a ſingle Digit never exceeds three places.

2. From the firſt Period towards the Left, ſubtract the greateſt Cube, and place its Root in the Quote; to the Remainder poſtpone the next Period and call it the Reſolvend.

3. To thrice the Square of the Quote add thrice the Quote for a Diviſor, and find how often it is contained in all the Figures of the Reſolvend except the laſt, place the Anſwer in the Quote, and multiply thrice the Square of the firſt Figure by the laſt, ſetting the Product two grades ſhort of the Units place.

Next multiply thrice the Square of the laſt Figure by the firſt, and ſet the Product one grade ſhort of the Units place.

Then Cube the laſt Figure, and ſet it under the Units place.

Oughtred's *Clavis*, Chap. 14.

The Sum of these Products is the Subducend, which taken from the Resolvend; to the Remainder postpone the next Period for a new Resolvend, and proceed therewith as with the first, repeating this *Rule* till the whole Extraction is finished.

$3aa = 27..$	48627125	$(365 =$ Root.
$3a = 9.$	27	aaa
Divisor $= 279.$	21627	Resolvend.
	162..	$3aae$
$3aa = 3888..$	324.	$3ace$
$3a = 108.$	216	eee
	19656	Subducend.
Divisor $= 38988.$	1971125	Resolvend.
	19440..	$3ace$
	2700.	$3ace$
	125	eee
	1971125	Subducend.

Rhmn's *Geometry*. p. 266.

Demonstration.

Fig. II. Let AB 12 be cut into two parts, *viz.* AC 10 and CB 2.

AC Cub.	AD	1000
$3AC^q \times CB$	$= GH + AE + BF$	$= 600$
$3CB^q \times AC$	$= GN + HC + BD$	$= 120$
CB Cub.	CN	8
Sum is the entire Cube		$= 1728$

Or by a new Method of Converging Series.

Mr. Raphson's *Analysis Æquationum.*

Let the Cube of (a) be equal to (c)

In Numbers $aaa = 48627125$

Supposing the unknown Quantity or Root to be divided into two parts, *viz.* $g + x = a$.

Put (g) equal to any Number greater or less than (a) which you may guess at by pointing the given Number, and considering the Root of the first Member.

And the *Theor.* will be $\frac{c - ggg}{3gg} = x$.

Then add or subtract (x) the Converging part of the second Member to or from (g), according to the Signes $+$ or $-$ with

with which work according to this *Theorem*, and from this new Operation a new (g) will arise, and if you repeat this Work, (g) the Number first taken, will at last Converge to a true Root, but the answer in the Fourth Operation will be exact enough in most Cases.

$300 = g$. 1 Operation.

300

$90000 = gg$

300

$27000000 = ggg$

$48627125 = c$

$3gg = 270000) +21627125 (+80.$

300

$380 = g$ 2 Operation.

380

$144400 = gg$

380

$54872000 = ggg$

$48627125 = c$

$3gg = 433200) -6244875 (-13$

380

367

$367 = g$ 3. Operation

367

$134689 = gg$

367

$49430863 = ggg$

$48627125 = c$

$3gg = 404067) -803738.000 (1.989$

$367.$

$365.011 = g$ 4. Op.

365.011

$133233.030121 = gg$

365.011

$48631521.5574966331 = ggg$

$48627125. = = = = = = = c$

$3gg = 399699.090363) -4396.5574966331 (-011$

365.011

$365 = a$ To

To extract the Root of

The *Square.*	*Byquadrate.*	5th. *Power.*
$aa=b.$	$qqqq=d.$	$aaaaa=f$
Theor. $\frac{b-cc}{2g}=x.$	$\frac{d-aaaa}{4qqq}=x.$	$\frac{f-qqqqq}{5qqqq}=x.$

Of the three Forms of Quadratick Equations.

1. $aa+ba=c$	2. $aa-ba=c$	3. $ba-aa=c$
Theor. $\frac{c-gg-bg}{2g+b}=x.$	$\frac{c+bg-gg}{2g-b}=x.$	$\frac{c+gg-bg}{b-2g}=x.$

Of the three Forms of Cubick Equations.

1. $aaa+ba=d.$	2. $aaa-ba=d.$	3. $ba-aaa=d.$
Theor. $\frac{d-ggg-bg}{3gg+b}=x.$	$\frac{d+bg-ggg}{3gg-b}=x.$	$\frac{d+ggg-bg}{b-3gg}=x.$

In *Geometry* there are three kinds of Magnitude,

3 *d* 1.
5 *d* 1.
11 *d* 1.

viz. { *Lines*, *Surfaces*, *Solids* } having { *length* only. *length* and *breadth*. *length*, *breadth*, and *depth*.

Motte's Trad. Geometry. P. 125.

Each of which is measured by some known kind of Magnitude that is like to it; as a Line is measured by a Line, a Surface by a Surface, and a Solid by a Solid; so when you have found how many *Lineal* Inches are in a *Line*, or how many *Square* Inches are in a *Surface*, or how many *Cube* Inches are in a *Solid*, then is the Content of either of these Magnitudes known.

Now the common Measure for *Gauging* is the *Gallon*, of which there are three sorts, *viz.* the *Ale-gallon* containing 282 Cube-Inches, the *Wine* 231, and the *Corn* 272.25.

Tacquet, *Geometry*, *P.* 289.

Dr. *Wybard* after a very diligent enquiry, concludes the *Wine-gallon* to contain but 224 or 225 Inches at most.

And by a late Experiment of Mr. *Walker's*, who caused a brazen Vessel to be made by an accurate Workman in form of a rectangular Parallelepipedon, whose Base was 4 Inches square, and Depth 14 Inches (as Mr. *Gunton* had done that for the *Ale-gallon*) it was found to contain only 224 Inches, for the Liquor in this Vessel exactly filled the *Standard Gallon in Guild-Hall*, *LONDON* (which is generally agreed to be the most ancient and true measure) in the presence of Mr. *Flamsteed*, Mr. *Halley*, and several other learned and worthy Gentlemen.

This

This setled by a Law, would improve the Revenue some Thousands *per Ann.*

Mensuration of Surfaces and Solids.

I. Prob. *By* AB, *and* BC: *to find the Area of* ABCD. *Fig.* III.

A *Square* is a Figure contained under four Right-Angles and four Sides. 30 ℔ 1.

An *Oblong* under four Right-Angles and four Sides, any two of which being oppofite are parallel and equal. 31 ℔ 1.

282) ABq 144 (.5106 A.G. Or AB × BC × .0035461. 35 ℔ 1.

II. Prob. *By* AC, *and* BP: *to find the Area of* ABC. *Fig.* V.

A *plain Triangle* is a Figure bounded by three Right Lines including three Angles. 21 ℔ 1.

564) AC × BP 168(.2979 A.G. Or AC × BP × .00177355 41 ℔ 1.

For a *Triangle* is $= \frac{1}{2}$ its circumscribing *Parallelogram.* *Gaugers Magaz.* P. 132.

Note, All manner of irregular right lined Figures may be reduced into Triangles, and thus measured.

III. Prob. *By* AB: *to find the Perifery* ABCD, &c cont. *Fig.* VI.

A *Circle* is a Figure contained under one Line, called the Perifery, Circumference or Perimeter as ACBD. 15 ℔ 1.

The *Centre* is a Point in the middle, from whence all right Lines drawn to the Perifery are equal. 16 ℔ 1.

A *Diameter*, as AB is a right Line drawn thro the Centre croſſing the Perifery, and dividing the Circle into two equal parts. 17 ℔ 1.

A *Chord* or *Subtenſe*, as CD is a right Line croſſing the Perifery, and dividing the Circle into two unequal parts. D. *Newton's Inſtit.* P. 41.

A *Verſed Sine*, as AE is a part of the Diameter comprehended between an Arch of the Perifery and its Chord. *Math. Inſtit.* P. 42.

A *Sector*, as ACKD is a part of a Circle contained by an Arch of the Perifery, and two Semi-diameters drawn from the Centre. 9 ℔ 3.

A *Segment*, as CAD is a part of a Circle bounded on one ſide by a Chord, and on the other by an Arch of the Perifery. 5 ℔ 3.

IV. Prob. *By* AB, *or* ACBD: *to find the Area*, &cont.

Dq	:	ABq	::	⊙D	: ⊙AB.
1	:	841	::	.0027851	: 2.3423 *A. G.*
Or, Pq	:	ACBDq	::	⊙P	: ⊙ACBD.
1	:	8300.3	::	.00023219	: 2.3423 *A. G.*

For

2 & 12. For the *Areas* of all Circles are in proportion as the Squares of their Diameters, or Periferies.

And √ 2.3423×359.054 = AB 29
√ 2.3423×3543.7163 = ACBD 91.106

	⊙ the D. 1.	□ of the ⊙ 1.		⊙ the P. 1.	□ of the ⊙ 1.
Inch.	.785398	1.273239		.0795775	12.566337
AG.	.0027851	359.054		.00028219	3543.7163
WG.	.0034	294.118		.00024449	2902.8315

D 1 : AB 29 :: Perif. of D 3.14159 : Perif. of AB 91.106
Or P 1 : ACBD 91.106 :: Diam. of P. 31831 : Di. of ACBD 29

Wreden. *Lib. Prop. Prop.* 8. For the *Periferies* of all Circles are proportional to their Diameters.

Note, All the Quotations from *Archimedes* are according to the Commentary of *Franciscus Maurolicus*, Printed at *Panorma*, *Anno* 1685.

Fig. VI. V. Prob. *By* AB, *and* AE : *to find the Area of* CAD.

Logar. compl. Arithm. CK 14.5 — — 8.838632
Logar. co-verſed Sine EK 6 —— 0.778151
Co-Sine of the Angle EKC 65°.56 = = 9.616783

Mr. *Collins's* Plain Scale, *p.* 118. Or, As the Sum of Hypothenuſe, and half the greater Side is to the leſſer Side :
So is 85.9437 deg. ($\frac{3}{4}$ of D. of a ⊙ whoſe P. is 360 deg.) to the Angle oppoſite to the leſſer Side.

KC + $\frac{1}{4}$ EC : EK :: Stat. N° : Angle ECK
21.1 : 6 :: 85.9437 : 24.44 °
whoſe Compl. to 90 degr. is the Angle EKC 65 .56

Gauger's Magazine, *p.* 134. Perif. : Angle CKD :: ⊙AB : Sector ACKD.
360 : 131.12 :: 660.52 : 240.57
Then ED 13.2 × EK 6 = Triangle CKD 79.2
And ACKD — CKD = Segment CAD
240.57 — 79.2 = 161.37 Inches

Or by Segments of a Circle.

AB : Radius :: AE : VS = Segment.
29 : 100 :: 8.5 : .2931 = .2443
And *Area* 660.52 × .2443 = CAD 161.37
Or, ⊙AB : Radius :: CAD : Segment = V. S.
660.52 : 10000 :: 161.37 : .2443 = .2931
And *Diameter* AB 29 × .2931 = AE 8.5.

VI. Prob.

rob. *By* AB, *and* CD: *to find the Perifery* ACBD. *Fig.* VII.

Ellipsis, as ACBD, is a Section of a *Cone* cut by a through both sides of the *Triangle* under the *Vertex*. 3. *Mydor.* 1. *Defin. tertia.*

: Radius :: CD : Axe = Perif. Sir *Jonas Moore's Fortificat.* p. 1.
: 100 :: 28.37 : .3532 = 2.2508
d *Axe* AB 80.31 × 2.2508 = ACBD 180.762

I. Prob. *By* AB, *and* ACBD: *to find the Conjugate Diameter* CD. *Fig.* VII.

: Radius :: ACBD : Perif. = Axe
: 100 :: 180.762 : 2.2508 = .3532
d *Axe* AB 80.31 × .3532 = CD 28.37

Prob. *By* AB, *and* CD: *to find the Area of* ACBD. *Fig.* VII.

: AB × CD :: ⊙D : ⊙ACBD.
: 80.31 × 28.37 :: .0027851 : 6.345 *A. G.* 8 *Archim. de Conoid. & Spheroid.* 1.
ce √AB × CD = Diam. whose *Area* is = *Ellipsis.*

Prob. *By* AB, CD, *and* AG: *to find the Area of* EAF. *Fig.* VII.

PR Chord of the *Circle* APBR = 65.1 *VanSchooten's Miscellan.* p. 312.
B : CD :: PAR : EAF
31 : 28.37 :: 2.354 : 0.832 *A. G.*

☞ *Or by Segments of a Circle.*

AB : Radius :: AG : V.S = Segment
31 : 100 :: 15.17 : .1889 = .1311
Area 6.345 × .1311 = EAF 0.832 *A. G.*

rob. *By* AB, CD, *and* CE: *to find the Area of* HCI. *Fig.* VIII.

FG Chord of the *Circle* CFDG = 26.4 *VanSchooten's Miscellan.* p. 312.
D : AB :: FCG : HCI
8.37 : 80.31 :: 0.548 : 1.551 *A. G.*

Prob. *By* AB, *and* VP: *to find the Area of* AVB. *Fig.* IX.

Parabola as AVB is a Section of a *Cone* cut by a *Plain* llel to the side of the *Triangle*. 1. *Mydor.* 1. *Defin. tertia.*

B 29 × $\frac{2}{3}$ VP 44.925 = AVB 1302.825

or a *Parabola* is = $\frac{2}{3}$ of its circumscribing *Parallelogram*. *Archim. de quadr. Parab.*

Prob. *By* AB, VP, *and* AE: *to find the Area of* AEF. *Fig.* IX.

ABq : 6AB − 4AE × VP :: AEq : AEF *Mr. Hodgson's Gauging.* p. 15.
3523 : 574 − 40 × 67.388 :: 100 : 359.91

Fig. IX. XIII. Prob. *By* AB, CD, *and* VP: *to find the Area of* CVD.

AB Cub. : CD Cub. :: AVB : CVD
24389 : 12167 :: 1302.825 : 649.95

Fig. X. XIV. Prob. *By* AB, *and* EP: *to find the Solidity of* ABCD.

13 & 11. A *Prism* is a Sold contained under several *Plains*, whose *Bases*, whether Triangular, Quadrangular, or Multangular, are equal, parallel, and alike situate.

21 & 11. A *Cylinder* as ABCD is a circular *Prism* made by the conversion of the rectangled *Parallelogram* APED about the *Side* EP, abiding fixed till the motion end where it began.

ABq × Factor × EP = Fruſtum.
841 × .0027851 × 50 = 117.114 *A. G.*

If the *Base* be an *Oblong*, or an *Ellipsis*, take the rectangle of the Conjugates in the *Base*.

Area of a Prism the Diam. or Side 1.			Dq or Sq of a Prism the Area 1.	
	Inches.	*Ale Gall.*	*Inches.*	*Ale Gall.*
Cyl.	.785358	.0027851	1.273239	359.054
III.	.433013	.0015355	2.309401	651.254
IV.	1.000000	.0035461	1.000000	282.000
V.	1.720478	.0061010	.581234	163.908
VI.	2.596075	.0092130	.384900	108.542
VII.	3.633931	.0128863	.275184	77.602
VIII.	4.828428	.0171221	.207104	58.404

Fig. XI. XV. Prob. *By* AB, *and* ZP: *to find the Solidity of* AZB.

22 & 11. A *Pyramid* is a Solid contained under divers *Plains*, and from a Triangular, Quadrangular, or Multangular *Base* decreases equally till it end in a Point at the *Vertex*.

23 & 11. A *Cone*, as AZB is a circular *Pyramid* made by the conversion of the *Triangle* AZP about its *Perpendicular* ZP, remaining fixed till the motion end where it began.

ZP, ZE } Axe of the Cone { AZB — — 120.8333
CZD — — 95.8333
AB, CD } Diameters of the Fruſtum { 29.
23.
EP, ER } Height of the Fruſt. { ABCD — 25.
CDnV — 13.
nV Diameter at that distance — — 26.12
Difference of Areas in Ale Gall. — — .8690

Z Sum 52 } S Semi-Sum 26 } of Diam. of the
X Difference 6 } N Semi-Difference 3 } Fruſt. ABCD.

ABq × Factor × ZP = AZB
841 × .00092837 × 120.8333 = 94.3417 } A.G.
Or ⊙AB2.3423 × ⅓ZP40.278 = AZB = 94.3417 } 8 ♂ 12.

For every *Pyramid* is = ⅓ of its circumſcribing *Priſm.* 10 ♂ 12.

Factors.			Diviſors.	
	Inches.	*Ale Gall.*	*Inches.*	*Ale Gall.*
Cone	.261799	.00092837	3.819717	1077.161
III.	.144338	.00051184	6.928203	1953.753
IV.	.333333	.00118203	1.000000	846.000
V.	.573493	.00203366	1.743702	491.724
VI.	.866025	.00371000	1.154700	325.626
VII.	1.211310	.00429543	.825552	232.806
VIII.	1.609476	.00570737	.621321	175.212

XVI. Prob. *By* AB, ZP, *and* ZE: *to find the Solidity of* CZD. *Fig.* XI.

ZP Cub. : ZE Cub. :: AZB : CZD
1764249 : 880135 :: 94.3417 : 47.0645 *A.G.* 8 ♂ 12.
Or AB Cub. : CD Cub. :: AZB : CZD 12 ♂ 12.
24389 : 12167 :: 94.3417 : 47.0645 *A.G.*
And AZB : CZD :: ZP Cub. : ZE Cub.
94.3417 : 47.0645 :: 1764249 : 880135.

☞ *Or by Segments of a Cone.*

ZP : Radius :: ZE : S.A = Segm.
120.8333 : 100 :: 95.8333 : .7931 = .4989
And *Content* 94.3417 × .4989 = CZD 47.0645 *A.G.*
Or AZB : Radius :: CZD : Segment = S.A.
94.3417 : 10000 :: 47.0645 : .4989 = .7931
And *Axe* AB 120.8333 × .7931 = ZE 95.8333

XVII. Prob. *By* ZP, ZE, *and* AB: *to find* CD, & cont. *Fig.* XI.

ZP : ZE :: AB : CD 4 ♂ 6.
120.8333 : 95.8333 :: 29 : 23
And ZE : ZP :: CD : AB
95.8333 : 120.8333 :: 23 : 29

XVIII. Prob. *By* AB, CD, *and* EP: *to find* ZP, & cont. *Fig.* XI.

AB − CD : AB :: EP : ZP 11 ♂ 5.
6 : 29 :: 25 : 120.8333

And AB : AB−CD :: ZP : ZE
29 : 6 :: 120.8333 : 95.8333

Fig. XI. XIX. Prob. *By* AB, CD, EP, *and* RP: *to find* nV.

EP : RP :: AB−CD : AB−nV.
25 : 12 :: 6 : 2.88

And AB 29 − 2.88 = nV 26.12

Or EP) AB−CD (D *Addend* or *Subducend.*
25) 6 (.24

And AB − D × RP = nV. Or CD + D × ER = nV.
29 − 2.88 = 26.12 23 + 3.12 = 26.12

Fig. XI. XX. Prob. *By* AB, CD, *and* EP: *to find the Solidity of* ABC

Mr. Day's Miscell. P. 41. 1077) Zq − AB × CD × EP = ABCD.
2704 − 667 × 25 = 47.28 *A. G.*

Mr. Anderson's Stereom. Prop. 5. 359) AB × CD + ⅓ Xq × EP = Frustum
667 + 12 × 25 = 47.28 *A. G.*

Metius's Pract. Geom. P. 196. ⊙S + ⅓ ⊙N × EP = Frustum.
1.8827 + .0084 × 25 = 47.28 *Ale Gall.*

☞ $\odot AB - \frac{1}{2}\sqrt{\odot AB - \odot CD} - \frac{1}{6}\odot x \times EP =$ Frustum.
2.3423 − .4345 − .0167 × 25 = 47.28 *A*

Or $\odot CD + \frac{1}{2}\sqrt{\odot AB - \odot CD} - \frac{1}{6}\odot x \times EP = ABCD$
1.4733 + .4345 − .0167 × 25 = 47.28

☞ Against 6 the Difference of Diameters stands 3.06
And 23 + 3.06 = 26.06 = 1.8911 × 25 = 47.28 *A. G.*

Frustum of a Cone.

D.D.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.91	0.96
2	1.01	1.06	1.11	1.16	1.21	1.26	1.31	1.36	1.41	1.46
3	1.52	1.57	1.62	1.67	1.72	1.77	1.82	1.87	1.92	1.98
4	2.03	2.08	2.13	2.18	2.23	2.28	2.33	2.39	2.44	2.49
5	2.54	2.59	2.64	2.70	2.75	2.80	2.85	2.90	2.95	3.01
6	3.06	3.11	3.16	3.21	3.27	3.32	3.37	3.42	3.47	3.53
7	3.58	3.63	3.68	3.73	3.78	3.83	3.89	3.94	3.99	4.05
8	4.10	4.15	4.20	4.26	4.31	4.36	4.41	4.46	4.52	4.57
9	4.62	4.68	4.73	4.78	4.83	4.89	4.94	4.99	5.04	5.10
10	5.15	5.20	5.25	5.31	5.36	5.41	5.47	5.52	5.57	5.62

To find the Solidity at any Depth, as at RP.

By *Prob.* 19. *ef* is 27.56 = 2.11552 RP12 = ABV*n*25.39 *A.G.*

☞ *Or by Segments of the Fruſtum of a Cone.*

CD 23) AB 29.00 (Tab. N° 1.26 againſt it ſtands (4) which *Note*,

EP : Radius :: ER : S. A = Segm^t. under (4)

25 : 100 :: 13 : .52 = .4628

And *Content* 47.28 x .4628 = CV*n*D 21.88 *A.G.*

ABCD : Radius :: CV*n*D : Segment = S. A.

Or 47.28 : 10000 :: 21.88 : 4628 = .52

And *Height* EP 25 × .52 = ER 13.

	1.08	1
	1.14	2
	1.20	3
	1.26	4

	1. *Fruſt.*	1. *Diff.*	2. *Dif.*	3. *D.*
1	2.3229			
		2.2845		
2	4.6074		.0381	
		2.2464		.003
3	6.8538		.0378	
		2.2086		.003
4	9.0624		.0375	
		2.1711		.003
5	11.2335		.0372	
		2.1339		.003
6	13.3674		.0369	
		2.0970		.003
7	15.4644		.0366	
		2.0604		.003
8	17.5248		.0363	
		2.0241		.003
9	19.5489		.0360	
		1.9881		.003
10	21.5370		.0357	
		1.9524		.003
11	23.4894		.0354	
		1.9170		.003
12	25.4064		.0351	
		1.8819		.003
13	27.2883		.0348	
		1.8471		.003
14	29.1354		.0345	
		1.8126		.003
15	30.9480		.0342	
		1.7784		.003
16	32.7264		.0339	
		1.7445		.003
17	34.4709		.0336	
		1.7109		.003
18	36.1818		.0333	
		1.6776		.003
19	37.8594		.0330	
		1.6446		.003
20	39.5040		.0327	
		1.6119		.003
21	41.1159		.0324	
		1.5795		.003
22	42.6954		.0321	
		1.5475		.003
23	44.2428		.0318	
		1.5156		.003
24	45.7584		.0315	
		1.4841		
25	47.2425			

Thus to find the Content upon *every Inch*, you need only the *four firſt Fruſtums*; for the *third Differences* being equal, the reſtare found by an eaſie Collection, as in the preceding *Table*.

And this will hold in the Fruſtum of any *regular polygonal Pyramidal Tun.*

But moſt Tuns having ſome irregularity in their Sides, and leaning alittle when fixed for conveniency of *Cleanſing*, A practical way is to meaſure in ſo much Liquor as will juſt

Fig. XIII. cover the Bottom or *Hoof* CeD: Then make CF = eB, and
Mr. Thomas Cooke. take the *Diameters* in the middle of every 10 Inches of the Frustum FCeB, so will (*im*) be the first 5 Inches from the top (*no*) the second 15 Inches from the top; now (gD) the Height of the *Hoof* being 3 Inches, the next Frustum will be 2, in the middle of which, *viz.* at 6 Inches from (*go*) take the mean *Diameter pr*, set them down with their proper *Areas*, and removing the Points one place forwards, by *Addition* you have the Content of FCeB, to which add the Liquor in the *Hoof* CeD, the Sum is the Content of FCBD.

If you take the *Diameters* in the *side Line* (as is usual) you must allow for the Difference between the *Perpendicular* and *slant Height* in every Segment.

Lastly, If from the whole Content you take the mean *Area* of the first 10 Inches ten times, and from the Remainder the mean *Area* of the second 10 Inches ten times, and from this last Remainder the mean *Area* of the next Frustum, till you wear out the *Depth*, you will make a Table shewing what *Gallons* are in the Tun at any number of *dry Inches*.

XXI. Prob. *By* BD, FG, *and* GH: *to find the Solidity of* FGB, *or* GDB.

Mr. Abrah. Sharp.

1077 6462) BD − FG (BD × $\sqrt{BD \times FG - FG^2}$ in FG × FT (FGB
29 × 25.8263 − 529 in 575 (19.57 *A. G.*

1077 6462) BD − FG (BDq − FG × $\sqrt{BD \times FG}$ in BD × GH (GDB
841 − 23 × 25.8263 in 725 (27.71

Or thus propè verum.

Mr. Davy's Gauger.

1077) FGq + ½FG × BD × FT (FGB
529 + 333.5 × 25 (20.02 *A. G.*

1077) BDq + ½FG × BD × GH (GBD
841 + 333.5 × 25 (27.26 *A. G.*

XXII. Prob. *By* BD, FG, GH, *and* EI, *or* FS: *to find the Solidity of* EKD, *or* FLM.

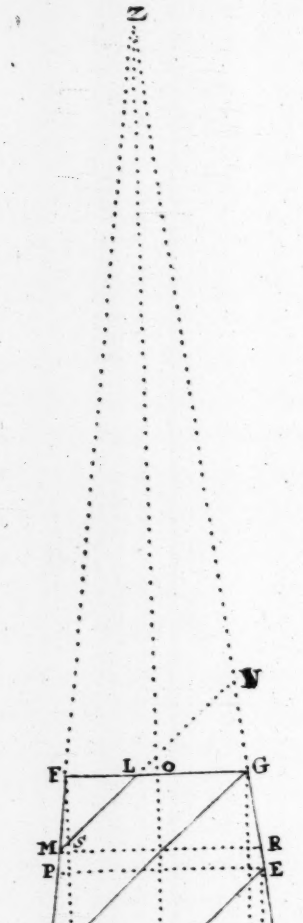
By *Prob.* 18. ZC Axe of the Cone ZBD is 120.8333
Mr. Abrah. Sharp. By *Prob.* 19. EP Diam. at top of the Segment is 26.12

$\sqrt{BH^2 + GH^2}$ = GB
676 + 625 = 36.069 } Transv. Diameter of the Liquors Surface.

GH 25 : BD 29 :: EI 12 : DK 13.92
GH 25 : GB 36.069 :: EI 12 : EK 17.313
FG 23 : EP 26.12 :: GB 36.069 : EN 40.962

Circles


BRITISH MUSEUM
19
53
FEB



Place this between pag 18 and 19

Circles Segment { BD 29 } & vers'd { DK 13.92 is 313.417 = S
whose Diam. is { EN 40.962 } Sine { EK 17.313 is 529.63 = T

$$S \text{ ——— } \frac{T \times EP \times \sqrt{BD \times FG}}{GBq} \times \tfrac{1}{3}ZC = EDK$$

313.417 —— 274.619 : × 40.278 = 1562.71

Again ZC − GH = ZO Axe of the Cone ZFG 95.8333

By *Prob.* 19. MR Diam. at top of the Segment is 25.4

GH 25 : FG 23 :: FS 10 : FL 9.2

GH 25 : GB 36.069 :: FS 10 : ML 14.428

BD 29 : MR 25.4 :: GB 36.069 : MV 31.6

Circles Segment { FG 23 } & vers'd { FL 9.2 is 155.17 = K
whose Diam. is { MV 31.6 } Sine { ML 14.428 is 348.76 = N

$$\frac{N \times MR \times \sqrt{BD \times FG}}{GBq} - K : \times \tfrac{1}{3}ZO = FLM$$

175.85 ——— 155.17 : × 31.944 = 660.6

XXIII. Prob. *By* { AB 38.4 : KN 32 } *Rectangular* { *Below*, } *Fig.* XVI.
{ CD 30. : HI 25 } *Conjugates* { *Above*, }
and Depth EP 25 : *to find the Solidity of the Elliptick Frustum* ABeCDe.

$$1077) : \overline{AB + CD \times NK} + \overline{CD \times HI} : \times EP \text{ (Frustum}$$

68.4 × 32 + 750 : × 25 (68.22 *A. G.* Mr. *Abrah. Sharp.*

Or find two *Geometrical Means* between the *Conjugates* above and below, and the Operation is the same as in *Prob.* 20.

XXIV. Prob. *By* AB, CD, RE, *and* AL : *to find* ALN. *Fig.* XIV.

By *Prob.* 18. ZE the Cone's Axe is 120.8333. Mr. *Hodgson's Gauging*, p. 114.

√EPq 210.25 − LEq 36 = LP.

6AB 174) PK cub. 18399.744 (105.746 which call (N)

Segment APLK when AB is 29 and AL 8.5 is 161.37

APLK − N × ⅓ZE = ALN

161.37 − 105.746 × 40.278 = 2240.42

XXV. Prob. *By* AB, CD, RE, *and* AL: *to find the Solidity of* ALT, *or* ALND. *Fig.* XV.

Divide AL by AB, and DN by DC, with the Quotients enter the *Table* under V. S. the Numbers found against them call T and Z. Mr. *Abrah. Sharp.*

Segment APLK when AB is 29, and AL 8.5 is 161.37

N) APLK × AL × T × RE (ALT

3) 161.37 × 8.5 × .369822 × 25 (4227.204

And

And Segment DaN*b* when DC is 23 and DN 5.5 is 76.28

N 3) APLK × AL × T − DaN*b* × DN × ⅞ Z = RE (ALDN
161.37 × 8.5 × .369822 − 76.28 × 5.5 × .376659 × 25 (2910.34
(*i. e.*) 10.34 *A. G.*

V.S.	T.	V.S.	T.	V.S.	T.	V.S.	T.
.0	.400000	.13	.388483	.26	.374104	.39	.355306
.1	.399192	.14	.387493	.27	.372843	.40	.353595
.2	.398373	.15	.386486	.28	.371555	.41	.351845
.3	.397543	.16	.385461	.29	.370239	.42	.350042
.4	.396701	.17	.384418	.30	.368894	.43	.348186
.5	.395846	.18	.383356	.31	.367520	.44	.346274
.6	.394978	.19	.382274	.32	.366116	.45	.344305
.7	.394196	.20	.381172	.33	.364680	.46	.342265
.8	.393299	.21	.380049	.34	.363211	.47	.340157
.9	.392286	.22	.378905	.35	.361707	.48	.337972
.10	.391358	.23	.377740	.36	.360166	.49	.335701
.11	.390415	.24	.376552	.37	.358587	.50	.333333
.12	.389457	.25	.375340	.38	.356968		

☞ *Or you may find* ALDN *or* LBCN *by Segments of a Circle* propè verum.

From or to AL or LB, subtract or add the *Semi-Difference* of the *Greater* and *Mean Diameter*, which *Note*, and say:

M.D : Radius :: Noted N° : V. S = Segm.
26.06 : 100 :: 7.03 : .2698 = .2176
And *Cont.* 47.28 × .2176 = ALDN 10.29 *A.G.*

GD 29
M.D 26.06
2.94
1.47
AL 8.5
7.03

Fig. XVII. XXVI. Prob. By { AB 38 : CD 30 } *Rectangular* { *Below*, / IF 28 : GH 24 } *Conjugates* { *Above*, } *and Depth* EP 50: *to find the Solidity.*

A *Prismoid* is a Solid contained under several Plains, whose *Bases* are rectangular *Parallelograms*, parallel and alike situate.

(*i. e.*) IF is directly opposite to AB, and GH to CD.

*Mr *Dary's Gauger*, p. 19.

When the *Bases* are *Circular* or *Elliptical*, then it is called a *Cylindroid*.

* 1077) : AB + ½ IF : × CD + : IF + ½ AB : × GH × EP (Frustum
: 38 + 14 : × 30 + : 28 + 19 × 24 × 50 (124.76 *A.G.*

Note

Note, By this *Prob.* you may find the Solidity of any *Tun*, whose parallel *Bases* are rectangular *Parallelograms* or *Ellipses* whether they are Alike or Unlike. Proportional or Disproportional, Alike situate or Inverted.

XXVII. Prob. *By* AB, *and* VP: *to find the Solidity of* AVB. *Fig.* XVIII.

AVB is a *Parabolick Conoid* made by the rotation of the *Semi-Parabola*, AVP about its Axe VP remaining fixed till the motion end where it began. 4. *Archim. de Conoid. & Spheroid.*

VP, VL } Axe of the Conoid — { AVB 67.388 / CVD 42.388
AB, CD } Diameters of the Frustum — { 29. / 23.
LP, EP } Height of the Frustum — { ABCD 25. / ABOR 12.
RO Diameter at that distance — 26.3
AG Versed Sine — 8.5
DF Versed Sine (=AG+DL−AP) — 5.5
X Difference, S Semi-Sum, N Semi-Differ. } of Diamet. of the Frust. ABCD { 6 / 26 / 3
Difference of Areas in Ale Gallons — .8690

ABq × Factor × VP — AVB
841 × .0013925 × 67.388 = 78.92 } *A. G.*
Or ⊙AB 2.3423 × ½ VP 33.694 = 78.92 }

For every *Parabolick Conoid* is = ½ its circumscribing *Cylinder*.

	Factors.	*Divisors.*
Inch	.392699	254.648
A. G.	.0013925	718.106
W. G.	.0017	588.236

11. *Archim. de Conoid. & Spheroid.* 2.

XXVIII. Prob. *By* AB, VP, *and* VL: *to find the Solidity of* CVD. *Fig.* XVIII.

VPq : VLq :: AVB : CVD
4541.14 : 1796.74 :: 78.92 : 31.228 *A. G.*
Or AVB : CVD :: VPq : VLq
78.92 : 31.228 :: 4541.14 : 1796.74

15. *Archim. de Conoid & Spheroid.* 2.

☞ *Or by Segments of a Parabolick Conoid.*

VP : Radius :: VL : S.A = Segment.
67.388 : 100 :: 42.388 : .629 = .3957
And *Content* 78.92 × .3957 = CVD 31.228 *A. G.*

Or

Or AVB : Radius :: CVD : Segment = S. A.
78.92 : 10000 :: 31.228 : .3957 = .629
And Axe VP 67.388 × .629 = VL 42.387.

Fig. XVIII. XXIX. Prob. *By* AB, VP, *and* VL : *to find* CD, & cont.

7 Hydrog. 1. VP : VL :: AB^q : CD^q
67.388 : 42,388 :: 841 : 529
Or VL : VP :: CD^q : AB^q
42.388 : 67.388 :: 529 : 841

Fig. XVIII. XXX. Prob. *By* AB, CD, *and* LP: *to find* VP, & cont.

Mr. Anderson's Stereomet. Prop. 3. 72. $AB^q - CD^q$: AB^q :: LP : VP
312 : 841 :: 25 : 67.388
Or AB^q : $AB^q - CD^q$ :: VP : LP
841 : 312 :: 67.388 : 25

Fig. XVIII. ☞ XXXI. Prob. *By* AB, CD, LP, *and* EP: *to find* RO.

LP : EP :: $AB^q - CD^q$: $AB^q - RO^q$
25 : 12 :: 312 : 149.76
And $\sqrt{AB^q}$ 841 − 149.76 = Ro 26.3
LP 25) $AB^q - CD^q$ 312 (D 12.48 *Attend. or Subducend.*
$\sqrt{AB^q - D \times EP} = RO$ Or $\sqrt{CD^q + D \times LE} = RO$
841 − 149.76 = 26.3 523 + 162.24 = 26.3

Fig. XVIII. XXXII. Prob. *By* AB, CD, *and* LP: *to find the Solidity of* ABCD.

$\odot AB - \left.\odot CD + \right\} \frac{1}{2} \odot x \times LP = ABCD$
1.4733 + .4345 × 25 = 47.695 *A. G.*

☞ Or $AB \times CD + \frac{1}{2} xq \times$ Factor × LP = Frustum
667 + 18 × .0027851 × 25 = 47.695

☞ Or ⊙S + ⊙N × LP = ABCD
1.8827 + .0251 × 25 = 47.695 *A. G.*

☞ Against 6 the *Difference* of *Diameters* stands 3.17
and 23 + 3.17 is = 26.17 = 1.9074 × 25 = 47.685 *A. G.*

Frustum of a Parabolick Conoid.

D.D.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	0.51	0.56	0.61	0.66	0.71	0.76	0.81	0.86	0.92	0.97
2	1.02	1.07	1.13	1.18	1.23	1.28	1.33	1.39	1.44	1.49
3	1.55	1.60	1.65	1.71	1.76	1.81	1.86	1.92	1.97	2.03
4	2.08	2.13	2.19	2.24	2.30	2.35	2.41	2.46	2.52	2.57
5	2.62	2.68	2.73	2.79	2.84	2.90	2.95	3.01	3.06	3.12
6	3.17	3.23	3.28	3.34	3.40	3.45	3.51	3.56	3.62	3.67
7	3.73	3.79	3.84	3.90	3.96	4.01	4.07	4.12	4.18	4.24
8	4.29	4.35	4.41	4.46	4.52	4.58	4.64	4.69	4.75	4.81
9	4.86	4.92	4.98	5.04	5.10	5.15	5.21	5.27	5.33	5.38
10	5.44	5.50	5.56	5.62	5.68	5.73	5.79	5.85	5.91	5.97

To find the Content at any Depth, as at EP. Fig. XVIII.

LP : EP :: $\frac{1}{2}\sqrt{\odot AB - \odot CD}$: $\frac{1}{2}\sqrt{\odot AB - \odot RO}$

25 : 12 :: .4345 : .2086

And $\odot AB_{2.3423} - .2086 \times EP_{12} = RABO_{25.604}$ *A. G.*

LP 25) $\frac{1}{2}\sqrt{\odot AB - \odot CD}$ .4345 (D .01738 *Addend* or *Subducend*

And $\odot AB - \overline{D \times EP} \times EP = RABO$

$2.3423 - .2086 \times 12 = 25.604$ *A. G.*

Or $\odot CD + D \times LE \times LE = DROC$

$1.4733 + .2259 \times 13 = 22.090$ *A. G.*

But the *Second Differences* being equal, the reſt after the *three firſt*, are found by an eaſie *Collection*, as in the following *Table*.

1. *Frustum*,

	1. Frust.	1. Diff.	2. Di.
1	2.3249		
		2.2901	
2	4.6150		.0348
		2.2553	
3	6.8703		.0348
		2.2205	
4	9.0908		.0348
		2.1857	
5	11.2765		.0348
		2.1509	
6	13.4274		.0348
		2.1161	
7	15.5435		.0348
		2.0813	
8	17.6248		.0348
		2.0465	
9	19.6713		.0348
		2.0117	
10	21.6830		.0348
		1.9769	
11	23.6599		.0348
		1.9421	
12	25.6020		.0348
		1.9073	
13	27.5093		.0348
		1.8725	
14	29.3818		.0348
		1.8377	
15	31.2195		.0348
		1.8029	
16	33.0224		.0348
		1.7681	
17	34.7905		.0348
		1.7333	
18	36.5238		.0348
		1.6985	
19	38.2223		.0348
		1.6637	
20	39.8860		.0348
		1.6289	
21	41.5149		.0348
		1.5941	
22	43.1090		.0348
		1.5593	
23	44.6683		.0348
		1.5245	
24	46.1918		.0348
		1.4897	
25	47.6825		

Fig. XVIII. XXXIII. Prob. *By* AB, CD, LP, *and* AG: *to find the Solidity of* AGFD.

By *Prob.* 30. VP Axe of the *Conoid* AVB is 67.388

By *Prob.* 5. Segm. AIGK when AB is 29 and AG 8.5 is 161.37

Mr. *Newton in Ganger's Pract.* p. 272.

AP : GP :: 2GP : EB And AB − EB = AE

14.5 : 6 :: 12 : 4.965 29 − 4.965 = 24.035

Segment AmEN when AB is 29 and AE 24.035 = 585.42

8 AIGK − AmEN × 12 VP = AGH

1290.96 − 585.12 × 5.616 = 3962.31

Again Segm. DbFd when DC is 23 and DF 5.5 is 76.28

DL : FL :: 2FL : SC And DC − SC = DS

11.5 : 6 :: 12 : 6.261 23 − 6.261 = 16.739

Segment

Segment DTSz. when DC is 23 and DS 16.739 = 323.94

$$\frac{1}{8}D\flat Fd - DTSz \times \frac{1}{12}VL = DFH$$

610.24 — 323.94 × 3.532 = 1011.21

And AGH — DFH = AGFD

3962.31 — 1011.21 = 2951.1 (*i.e.*) 10.46 *A. G.*

☞ *Or by Segm. of a Circle* quam proximè.

From or to AG, or GB, subtract or add the *Semi-Difference* between the *Greater* and *Mean Diameter*, which reserve and say:

M.D. : Rad. :: reser. N° : V.S. = Segment

26.17 : 100 :: 7.085 : .2707 = .2186

G.D.	29
M.D.	26.17
	2.83
	1.415
A. G.	8.5
	7.085

And *Content* 47.695 × .2186 = AGFD 10.44 *A. G.*

Suppose this had been the Frustum of a *Cone* cut by a *Plain* parallel to the *Axe*.

If you put Z = Sum of the Squares of AB and CD, then

3Z : 2Z + 2AB × CD :: Conoid : Cone

4110 : 2740 + 1334 :: 10.46 : 10.36 *A. G.*

Mr. *Hodgson's Gauging*, P. 93.

XXXIV. Prob. *By* { AB 38.4 : KN 32 } *Rectang.* { *Below*, } Fig. XVII.
{ CD 30. : HI 25 } *Conjug.* { *Above*, }
and Depth EP 25 : *to find the Solidity of the Elliptick Frustum* AB*b*CD*h*A.

AB × KN + CD × HI × Factor × EP = ABCD

1228.8 + 750 × .0013925 × 25 = 68.89 *A. G.*

Or find *two Geometrical Means* between the Conjugates Above and Below, and the Operation is the same as in *Prob.* 32.

Mr. *Hodgson's Gauging*, P. 90.

XXXV. Prob. *By* AB, *and* CD: *to find the Solidity of* ACBD. *Fig.* XIX.

ACBD is a *Parabolick Spindle* generated by the rotation of the *Parabola* ACB about its *double Ordinate* AB, remaining fixed till the motion end where it began.

Dr. *Wallis de Calculo, Cent. Grav.* Cap. 5. Part 2.

AB	Axe or double Ordinate		109.924
AE, EB	Height of the Frustum	HAI	29.962
		HBI	79.962
EP	Length of the middle Frustum	HSSI	50.
HI, CD	Diameters of that Frustum		23.
			29.
RK	Distance from CD		12.

NL Diameter at that Distance ——— 27.6176
× Difference of Diameters ——— 6.
Difference of Areas in *A. G.* ——— .8690

CDq × AB × Factor = ACBD
841 × 109.924 × .0014854 = 137.31 } *A. G.*
Or ⊙CD2.3423 × 8/15 AB58.624 = 137.31 }

Cavalier Theor. Quer. p. 282.

For every *Parabolick Spindle* is = 8/15 of its *Circumscribing Cylinder.*

	Factors	*Divisors*
Inch.	.4188792	2.387323
A.G.	.0014854	673.2193
W.G.	.0018133	551.480

Fig. XIX. ☞ XXXVI. Prob. *By* AB, CD, *and* AE: *to find* HI, & contra.

AKq : AE × EB :: CD : HI
3020.833 : 2395.823 :: 29 : 23
And AE × EB : AKq :: HI : CD
2395.823 : 3020.833 :: 23 : 29

Fig. XIX. ☞ XXXVII. Prob. *By* AB, CD, *and* AE: *to find the Solidity of* HAI *by Segments of a Parabolick Spindle.*

AB : Radius :: AE : S. A. = Segm.
109.24 : 100 :: 29.962 : .2726 = .1287
And *Content* 137.31 × .1287 = HAI 17.671 *A. G.*
Or ACBD : Radius :: HAI : Segment = S. A
137.31 : 10000 :: 17.671 : .1287 = .2726
And *Axe* AB 109.924 × .2726 = AE 29.965

Fig. XIX. ☞ XXXVIII. Pr. *By* CD, HI, *and* EP: *to find* AB, & cont.

CD − HI : CD :: EKq : AKq
6 : 29 :: 625 : 3020.833
And CD : CD − HI :: AKq : EKq
29 : 6 :: 3020.833 : 625

Fig. XIX. ☞ XXXIX. Prob. *By* CD, HI, EP, *and* RK: *to find* NL.

EKq : RKq :: CD − HI : CD − NL
625 : 144 :: 6 : 1.3824
And CD 29 − 1.3824 = NL 27.6176
Or EKq) CD − HI (D *Subducend*
625) 6 (.0096
And CD 29 − D × RKq 1.3824 = NL 27.6176.

Mr. Hodgson's Gaug. p. 100.

Or EKq : ER × RP :: CD − HI : NL − HI
625 : 481 :: 6 : 4.6176
And HI 23 + 4.6176 = NL 27.6176.

☞ XL.

☞ XL. Prob. *By* CD, HI, *and* EP: *to find the Solidity of* HSSI. Fig. XIX.

$$\odot CD - \tfrac{1}{3}\odot CD - \odot HI - \tfrac{2}{15}\odot x : \times EP = \text{Frustum}$$
$$2.3423 \quad .2896 \quad .0134 \quad : \times 50 = 101.965 \; A.G.$$

Or $CD^3 + \frac{1}{2}HI q - \frac{1}{5} xq \times$ Factor $\times EP =$ HSSI Mr. Abrah. Sharp.
$$841 + 264.5 - 7.2 \times .0018567 \times 50 = 101.96$$

☞ Against 6 the Difference of Diameters stands 4.06
and $23 \times 4.06 = 27.06 = 2.0393 \times 50 = 101.965$ *A.G.*

Frustum of a Parabolick Spindle.

D.D.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	0.67	0.74	0.80	0.87	0.94	1.00	1.07	1.14	1.21	1.27
2	1.34	1.41	1.47	1.54	1.61	1.68	1.75	1.81	1.88	1.95
3	2.02	2.08	2.15	2.22	2.28	2.35	2.42	2.49	2.56	2.63
4	2.70	2.76	2.83	2.90	2.97	3.04	3.10	3.17	3.24	3.31
5	3.38	3.44	3.51	3.58	3.65	3.72	3.78	3.85	3.92	3.99
6	4.06	4.13	4.20	4.26	4.33	4.40	4.47	4.54	4.61	4.68
7	4.75	4.81	4.88	4.95	5.02	5.09	5.16	5.23	5.25	5.36
8	5.43	5.50	5.57	5.64	5.71	5.78	5.85	5.92	5.99	6.05
9	6.12	6.19	6.26	6.33	6.40	6.47	6.54	6.61	6.68	6.75
10	6.82	6.89	6.95	7.02	7.09	7.16	7.23	7.30	7.37	7.44

☞ *To find the Solidity at any Depth, as at* RK. Fig. XIX.

$$EK^3 : RK^3 :: \tfrac{1}{3}\odot CD - \odot HI + \tfrac{2}{15}\odot x : D$$
$$625 : 144 :: .2896 + .0134 : .0698$$
And $\odot CD\ 2.3423 - .0698 \times RK\ 12 = NCDL\ 27.27$ *A.G.*

$$EK^3\ 625 \;\big)\; \tfrac{1}{3}\odot CD - \odot HI + \tfrac{2}{15}\odot x \;\big(\; D \text{ Subducend}$$
$$.2896 + .0134 \;\big(\; .0004849$$
And $\odot CD - D \times RK^3 : \times RK = \text{Frustum}$
$$2.3423 \quad .0698 \quad : \times 12 = 27.27 \; A.G.$$

But the *Toird Differences* being *equal*, the reſt after the *four firſt* are found by an eaſie *Collection*; as in the following *Table*.

	1. *Fruſt.*	1. *Diff.*	2. *Dif.*	3. *D.*
1	2.3418			
		2.3389	.0058	
2	4.6807			.029
		2.3331	.0087	
3	7.0138			.029
		2.3244	.0116	
4	9.3382			.029
		2.3128	.0145	
5	11.6510			.029
		2.2983	.0174	
6	13.9493			.029
		2.2809	.0203	
7	16.2302			.029
		2.2606	.0232	
8	18.4908			.029
		2.2374	.0261	
9	20.1282			.029
		2.2113	.0290	
10	22.9395			.029
		2.1823	.0319	
11	25.1218			.029
		2.1504	.0348	
12	27.2722			.029
		2.1156	.0377	
13	29.3878			.029
		2.0779	.0406	
14	31.4657			.029
		2.0373	.0435	
15	33.5030			.029
		1.9938	.0464	
16	35.4968			.029
		1.9474	.0493	
17	37.4442			.029
		1.8981	.0522	
18	39.3423			.029
		1.8459	.0551	
19	41.1882			.029
		1.7908	.0580	
20	42.9790			.029
		1.7328	.0609	
21	44.7118			.029
		1.6719	.0638	
22	46.3837			.029
		1.6081	.0667	
23	47.9918			.029
		1.5414	.0656	
24	49.5332			
		1.4718		
25	51.0050			

Fig. XX. ☞ XLI. Prob. *By* AB, CD, *and* CG: *to find* HI, & cont.

CKq : CG × GD :: AB : HI
210.25 : 174.25 :: 109.924 : 91.102
And CG × GD : CKq :: HI : AB
174.25 : 210.25 :: 91.102 : 109.924

Fig. XX. XLII. Prob. *By* AB, CD, *and* CG: *to find the Solidity of* HCL

☞ XLIII. Prob.

XLIII. Prob. *By* CD, SS, EP, *and* CG: *to find the Solidity of* bSCSn, *by Segments of a Circle,* propè verum. Fig. XX.

From or to CG, or GD, subtract or add the *Semi-Difference* of the *Bung* and *Mean Diameter*, which reserve and say:

B.D. 29
M.D 27.06
1.94
Half .97
CG 8.5
7.53

M.D : Radius : : res^{d}. N° : V.S = Segm.
27.06 : 100 :: 7.53 : .2783 = .2272

And *Cant.* 101.965 × .2272 = *b*SCSn 23.166 *A.G.*

XLIV. Prob. *By* AB: *to find the Solidity of* ACBD, & cont. Fig. XXI.

ACBD is a *Sphere* made by the rotation of the *Semi-Circle* ACB about its *Axe* AB remaining fixed till the motion end where it began. 12 & 11.

AB Axe or Diameter ——— 82.09
AE, EB Height of the Frustum — CAD 16.045, CBD 66.045
EK Distance from the Centre ——— 25.
CD Diameter at that distance ——— 65.1

DCub. : AB^{q} × AB :: Solid. D : Solid. ACBD
1. : 6738.768 82.09 :: .00185673 = 1027.116 } *A.G.*
Or ⊙AB 18.7681 × $\frac{2}{3}$ AB 54.727 = 1027.116 }

For every *Sphere* is $= \frac{2}{3}$ of its circumscribing *Cylinder*.

	Solid. D. 1.	Dc Sol. 1.
Inch.	.52 35988	1.909859
A. G.	.00185673	538.5803
W. G.	.00226667	441.1775

Archim. de Spher. & Cylin. Pr. 28.

And the Solidities of all *Spheres* are in proportion as the Cubes of their *Diameters* or *Axes*. 12 & 11.

And √ (3) Solid. ACBD × D Cub. = AB
1027.116 × 538.5803 = 82.09 *Archim. Lib. Prepar. Prop. 3.*

XLV. Pr. AB, CD, AE, *By any two of these: to find the other.* Fig. XXI.

√ AE × FB = ED
1059.692 = 32.55

Or √ KD^{q} − EK^{q} = ED
1684.692 − .625 = 32.55

AE 16.045) ED^{q} 1059.692 (EB 66.045

And EB + AE = AB
66.045 + 16.045 = 82.09

√KD^{q} − ED^{q} = EK
1684.692 − 1059.692 = 25.

And AK − EK = AE
41.045 − 25 = 16.045

NB. By this *Prob.* you may also find the *Chord*, *Diameter*, and *Versed Sine* of a *Circle*.

Fig. XXI. XLVI. Prob. *By* AB, CD, *and* AE: *to find the Solidity of* CAD.

Mr. Anderson's Stereom. Prop. 36. EB : $\frac{1}{2}$EB+$\frac{1}{6}$AE :: ⊙CD × AE : CAD
66.045 : 35.6967 :: 189.384 : 102.36 *A.G.*
And this will hold if it were the Frustum of a *Spheroid*.

☞ Or EB+AK × $\frac{4}{3}$ AEq × Factor = CAD
107.09 × 343.256 × .0027851 = 102.37 *A.G.*

Arab. 39. Or 4AEq × AK − $\frac{1}{3}$ AE × Factor = CAD
1029.768 × 35.697 × .0027851 = 102.37 *A.G.*

Dary's Coell. 33. Or CDq + $\frac{4}{3}$AEq × Factor × $\frac{1}{2}$ AE = CAD
4238.01 + 343.256 × .0027851 × 8.0225 = 102.37 *A.G.*
And this will hold if it were the Frustum of a *Spheroid*, if you take the *Rectangle* of the *Conjugates* in the *Base*.

☞ *Or by Segments of a Sphere.*

AB : Radius :: AE : S.A = Segment
82.09 : 100 :: 16.045 : .1954 = .0997
And *Content* 1027.116 × .0997 = CAD 102.37 *A.G.*
Or ACBD : Radius :: CAD : Segment = S.A.
1027.116 : 10000 :: 102.37 : .0997 = .1954
And *Axe* AB 82.09 × .1954 = AE 16.045

Fig. XXII. XLVII. Prob. *By* AB, *and* CD: *to find the Solidity of* ACBD.

6 Archim. de Conoid. & Spheroid. 1. ACBD is a *Spheroid* made by the rotation of the *Semi-Ellipsis* ACB about its *Axe* AB remaining fixed till the motion end where it began.

AB Spheroid's Axe —— 82.09
AE, EB } Height of the Frust. { HAI — 16.045, HBI — 66.045
EP Length of the middle Frustum HRSI — 50.
HI, CD } Diameters of that Frustum { —— 23., —— 29.
RK Distance from CD —— 12.
NO Diameter at that Distance —— 27.74
Difference of Areas in *A.G.* —— .8690

ABq : CDq :: AFBG : ACBD
6738.7681 : 841 :: 1027.116 : 128.18 *A.G.*

CDq × AB × Factor = ACBD
841 × 82.09 × .0018567 = 128.18
12. & 25. Archimed. de Conoid. & Spheroid. 2. Or ⊙CD 2.3423 × $\frac{2}{3}$AB 54.727 = 128.18 } *A.G.*

For every *Spheroid* is = $\frac{2}{3}$ of its *Circumscribing Cylinder*.

XLVIII.

XLVIII. Prob. *By* AB, CD, *and* AE: *to find* HI, & cont. Fig. XXII.

AKq : AE×EB :: CDq : HIq
1684.692 : 1059.692 :: 841 : 529 S. Newton. L.
And AE×EB : AKq :: HIq : CDq
1059.692 : 1684.692 :: 529 : 841
☞ Or AK : $\sqrt{}$AE×EB :: CD : HI
41.045 : 32.55 :: 29 : 23

XLIX. Prob. *By* AB, HI, *and* AE: *to find the Solidity of* HAI. Fig. XXII.

EB : EB+KB :: ⊙HI × $\frac{1}{3}$AE : HAI 20. *and* 25. *Archim. de Conoid. & Spheroid.* 2.
66.045 : 107.09 :: 7.88 : 12.775 *A.G.*
And this will hold if it were the Fruſtum of a *Sphere.*
Or ABq : CDq :: FAG : HAI
6738.7681 : 841 :: 102.37 : 12.775 *A. G.*

☞ *Or by Segments of a Sphere.*

AB : Radius :: AE : S.A = Segment
82.09 : 100 :: 16.045 : .1954 = .0997
And *Content* 128.18 × .0997 = HAI 12.775 *A. G.*
Or ACBD : Radius :: HAI : Segment = S. A.
128.18 : 10000 :: 12.775 : .0997 = .1954
And *Axe* AB 82.09 × .1954 = AE 16.045

☞ L. Prob. *By* CD, HI, *and* EP: *to find* AB, & cont. Fig. XXII.

CDq − HIq : CDq :: EKq : AKq
312 : 841 :: 625 : 1684.692
And CDq : CDq − HIq :: AKq : EKq
841 : 312 :: 1684.692 : 625
Or $\sqrt{}$CDq − HIq : CD :: EK : AK Mr. *Anderſon's Steren.* Prop. *p.* 71.
17.6635 : 29 :: 25 : 41.045

LI. Prob. *By* CD, HI, EP, *and* RK: *to find* NO. Fig. XXII.

EKq : RKq :: CDq − HIq : CDq − NOq *Gunter's Magaz. p.* 222.
625 : 144 :: 312 : 71.88
And $\sqrt{}$CDq 841 − 71.88 = NO 27.74
Or EKq) CDq − HIq (D *Subducend*
625) 312 (.04992
And $\sqrt{}$CDq 841 − D × RKq 71.88 = NO 27.74
Or EKq : ER × RP :: CDq − HIq : NOq − HIq *Maj. John Farmer.*
625 : 481 :: 312 : 240.12
And $\sqrt{}$HIq 529 + 240.12 = NO 27.74

☞ LII.

Fig. XXIII. ☞ LII. Prob. *Let* CAbGNBbD *repreſent the firſt Form of Caſks, viz. the Middle Fruſtum of a Spheroid: to find the Solidity.*

$AB^q + \frac{1}{2}CD^q \times \text{Factor} \times EP = \text{Fruſtum}$
$841 + 264.5 \times .0018567 \times 50 = 102.63$ *A. G.*

$\left.\begin{array}{l} \odot CD + \frac{2}{3}\odot AB - \odot CD \\ \odot AB - \frac{1}{3}\odot AB - \odot CD \end{array}\right\} \times EP = \text{Fruſtum}$
$2.3423 \quad .2896 \quad \times 50 = 102.63$ *A. G.*

Mr. Davy's Gauger p. 56.

To find the Solidity at any Depth, as at RK.

$EK^q : RK^q :: \frac{1}{3}\odot AB - \odot CD : \frac{1}{3}\odot AB - \odot m$
$625 : 144 :: .2896 : .0667$
And $\odot AB\ 2.3423 - .0667 \times RK\ 12 = bAB^b\ 27.31$ *A. G.*

Or $EK^q\ 625 \Big) \frac{1}{3}\odot AB - \odot CD\ .2896 \Big(D$ *Subducend* $.0004634$

And $\odot AB - D \times RK^q : \times RK = \text{Fruſtum}$
$2.3423 - .0667 : \times 12 = 27.31$ *A. G.*

But the *Third Differences* being *equal*, the reſt after the *firſt Four* are found by an eaſie *Collection*, as in the following *Table*.

1. *Fruſtum*

	1. Fruſt.	1. Diff.	2. Di.	3. D.
1	2.3418			
2	4.6808	2.3390	.0056	
3	7.0142	2.3334	.0084	.028
4	9.3392	2.3250	.0112	.028
5	11.6530	2.3138	.0140	.028
6	13.9528	2.2998	.0168	.028
7	16.2358	2.2830	.0196	.028
8	18.4992	2.2634	.0224	.028
9	20.7402	2.2410	.0252	.028
10	22.9560	2.2158	.0280	.028
11	25.1438	2.1878	.0308	.028
12	27.3008	2.1570	.0336	.028
13	29.4242	2.1234	.0364	.028
14	31.5112	2.0870	.0392	.028
15	33.5590	2.0478	.0420	.028
16	35.5648	2.0058	.0448	.028
17	37.5258	1.9610	.0476	.028
18	39.4392	1.9134	.0504	.028
19	41.3022	1.8630	.0532	.028
20	43.1120	1.8098	.0560	.028
21	44.8658	1.7538	.0588	.028
22	46.5608	1.6950	.0616	.028
23	48.1942	1.6334	.0644	.028
24	49.7632	1.5650	.0672	
25	51.2650	1.5018		

☞ *Or by Segments of the Fruſtum of a Spheroid.* Fig. XXIII.

CD) AB (N°
23) 29 (1.26 Againſt it ſtands (4) which *Note.*

EP : Radius :: ER : S. A = Segment under (4)
50 : 100 :: 13 : .26 = .234

And *Content* 102.63 × .234 = *b*CD*b* 24.0154 *A. G.*

1.08	1
1.14	2
1.20	3
1.26	4

Or *Content* : Radius :: *b*CD*b* : Segm. = S. A.
102.63 : 1000 :: 24.0154 : .234 = .26
And *Height* EP 50 × .26 = ER 13.

☞ LIII. Prob. *Let* CdAdGNdBdD *repreſent the ſecond Form of Caſk, viz. when neareſt the middle Fruſtum of a Spheroid: to find the Solidity.* Fig. XXIII.

⊙AB − $\frac{1}{18}$⊙AB − ⊙CD × EP = Fruſtum
2.3423 —— .3379 × 50 = 100.22 *A. G.*

☞ To

☞ *To find the Solidity at any Depth, as at* RK.

EKq $\frac{7}{18}$⊙AB − ⊙CD) D *Subduced*
625) .3379 (.0005407
And ⊙ AB − D × .RKq : × RK = *d*ABd
2.3423 — .0779 : × 12 = 27.173 *A. G.*

Fig. XXIII. ☞ LIV. Prob. *Let* CeAeGNeBeD *repreſent the third Form of Casks, viz. when nearest the middle Fruſtum of two Parabolick Conoids: to find the Solidity.*

⊙AB − $\frac{4}{9}$⊙AB − ⊙D × EP = Fruſtum
2.3423 — .3862 × 50 = 97.80 *A. G.*

☞ *To find the Solidity at any Depth, as at* RK.

EKq $\frac{4}{9}$⊙AB − ⊙CD) D *Subduced*
625) .3862 (.0006179
And ⊙AB − D × RKq : RK = eABe
2.3423 — .0890 : × 12 = 27.040 *A. G.*

To make this *Treatiſe* more compleat, I have added the following *Tables* for finding a *Mean Diameter* according to the three precedent *Forms*; ſo the *Gauger* may uſe either, or both, as he thinks fit.

A Table for the firſt Form of Casks.

D.D.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	0.68	0.74	0.81	0.87	0.94	1.01	1.08	1.15	1.21	1.28
2	1.35	1.42	1.49	1.56	1.63	1.70	1.76	1.83	1.90	1.97
3	2.04	2.11	2.18	2.25	2.32	2.39	2.46	2.53	2.60	2.67
4	2.74	2.81	2.88	2.95	3.02	3.09	3.16	3.23	3.30	3.37
5	3.44	3.51	3.58	3.65	3.72	3.79	3.86	3.93	4.00	4.08
6	4.15	4.22	4.29	4.36	4.43	4.50	4.58	4.65	4.72	4.79
7	4.86	4.93	5.01	5.08	5.15	5.22	5.29	5.37	5.44	5.51
8	5.58	5.66	5.73	5.80	5.87	5.94	6.02	6.09	6.16	6.24
9	6.31	6.38	6.45	6.53	6.60	6.67	6.75	6.82	6.89	6.96
10	7.04	7.11	7.19	7.26	7.33	7.41	7.48	7.55	7.63	7.70

A Table for the ſecond Form of Casks.

D.D.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	0.62	0.68	0.74	0.80	0.86	0.93	0.99	1.05	1.12	1.18
2	1.24	1.30	1.37	1.43	1.49	1.56	1.62	1.68	1.75	1.81
3	1.88	1.94	2.01	2.07	2.13	2.20	2.26	2.33	2.39	2.45
4	2.52	2.58	2.65	2.71	2.78	2.84	2.91	2.97	3.04	3.10
5	3.17	3.23	3.30	3.37	3.43	3.50	3.56	3.63	3.69	3.76
6	3.83	3.89	3.96	4.03	4.09	4.16	4.23	4.29	4.36	4.42
7	4.49	4.56	4.62	4.69	4.76	4.82	4.89	4.95	5.03	5.09
8	5.16	5.23	5.29	5.36	5.43	5.50	5.57	5.63	5.70	5.77
9	5.83	5.90	5.97	6.04	6.11	6.18	6.24	6.31	6.38	6.45
10	6.52	6.59	6.65	6.72	6.79	6.86	6.93	7.00	7.06	7.13

A Table for the third Form of Casks.

D.D.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	0.56	0.62	0.67	0.73	0.79	0.84	0.90	0.96	1.02	1.07
2	1.13	1.19	1.25	1.30	1.36	1.42	1.48	1.54	1.60	1.65
3	1.71	1.77	1.83	1.89	1.95	2.01	2.06	2.12	2.18	2.24
4	2.30	2.36	2.42	2.48	2.54	2.60	2.66	2.72	2.78	2.84
5	2.90	2.96	3.02	3.08	3.14	3.20	3.26	3.32	3.38	3.44
6	3.50	3.56	3.62	3.68	3.75	3.81	3.87	3.93	3.99	4.05
7	4.11	4.17	4.24	4.30	4.36	4.42	4.48	4.55	4.61	4.67
8	4.73	4.79	4.86	4.92	4.98	5.04	5.10	5.17	5.23	5.29
9	5.35	5.42	5.48	5.54	5.61	5.67	5.73	5.79	5.85	5.92
10	5.98	6.05	6.11	6.17	6.24	6.30	6.37	6.43	6.49	6.56

The Uſe of the aforeſaid Tables.

			A.G.	
Againſt 6 *Differ.* of *Diamet.* under (o) in the anſwerable *Square* ſtands	4.15	which added to 23 the *Head*	27.15	=2.0527
	3.83		26.83	=2.0044
	3.50		26.5	=1.9561

		Differ.
Theſe drawn ſeverally into 50, the *Length* give the *Contents* in *A. G.*	102.64	2.42
	100.22	2.42
	97.80	2.42
Content as two *Parabolick Conoids*	95.38	

Here you ſee the *Differences* are all *equal*, ſo leſs room left for *Error*.

Hence

Hence I conclude, that theſe are the moſt genuine ways of *Cask-Ganging* yet extant, and as exact as need be, conſidering their uncertain *Form*; for by knowledg only of the *Diameters* and *Length*, the true *Contents* of all *Casks* cannot be found by one *General Rule*, becauſe it's poſſible for *two Casks* to have the ſame *Dimenſions*, and yet the *ſpace* between the *Bung* and *Head* may be more *Circular* in one than in the other, and conſequently more capacious; and ſince we muſt neceſſarily wander from *Truth*, 'tis better done in a plain and eaſie way, than in ſuch tedious ones as ſome of our *lateſt Writers* have laid down.

Dr. Wyhard's Teſtament. P.

Fig. XXIII. 47 ℈ 1.

LV. Prob. FB, EP, BC, *By any two of theſe: to find the other.*

$\surd$ CF*q* 625 + FB*q* 676 = BC 36.07 *Diagonal.*
$\surd$ BC*q* 1301 − FB*q* 676 = CF 25 *Semi-Length*
$\surd$ BC*q* 1301 − CF*q* 625 = FB 26 *Semi-Sum of Diam.*
And 2FB − AB = CD Or 2FB − CD = AB
52 − 29 = 23 52 − 23 = 29

Fig. XXIV. R. Hydr. l.

LVI. Prob. *By* AB, CD, *and* CG: *to find* HI, & cont.

CK*q* : CG × GD :: AB*q* : HI*q*
210.25 : 174.25 :: 6738.7681 : 5584.92
And CG × GD : CK*q* :: HI*q* : AB*q*
174.25 : 210.25 :: 5584.92 : 6738.7681

VanSoeslen's Miſcellan. p. 312.

Or CK : $\surd$CG × GD :: AB : HI
14.5 : 13.2 :: 82.09 : 74.73

Fig. XXIV.

LVII. Prob. *By* AB, CD, *and* CG: *to find the Solidity of* HCI.

Dr. Wallis's Mecha. Pa. 1. Ch. 5.

CD*q* × CD : CD*q* × AB :: PCV : HCI
24389 : 69037.69 :: 9.37 : 26.58 *A. G.*

☞ *Or by Segments of a Sphere.*

CD : Radius :: CG : S.A = Segment.
29 : 100 :: 8.5 : .2931 = .2074
And *Content* 128.18 × .2074 = HCI 26.58 *A. G.*
Or ACBD : Radius :: HCI : Segment = S. A.
128.18 : 1000 :: 26.58 : .2074 = .2931

Fig. XXIV.

LVIII. Prob. *By* CD, EE, LO, *and* CG: *to find the Solidity of* hECRPp.

Mr. Hodgſon's Gauging, P. 112.

By *Prob.* 50. AB the *Spheroid's Axe* is —— 82.09
By *Prob.* 56. *dn Axe* in the middle of the Fruſtum is 80.31
By 47 *Eucl.* 1. *eS* the *Conjugate Diameter* is 28.37
By *Prop.* 8. the *Area* of this *Ellipſis* is 6.345 *A. G.*
By *Prop.* 9. the *Area* of the *Ellipſis Segment* when the *Axe dn* is 80.31, and *Verſed Sine* Kn 15.18 is 0,833 *A. G.*

And

And the *Area* of the *whole Ellipſis* 6.345 leſs twice the *Area* of the *Ellipſis Segment* 1.666 is 4.679, which drawn into GK, the *Height* 6 gives the *Solidity* of Lhpo 28.074, this taken from the *Semi-Content* 51.315, leaves the *vacant Fruſtum* hECRp 23.241 *A. G.*

☞ *Or by Segments of a Circle* propè verum.

From or to CG, or GD the *Dry* or *Wet Inches*, ſubtract or add the *Semi-Difference* of the *Bung* and *Mean Diameter*, which reſerve and ſay:

BD	29	
M.D	27.15	
		1.85
Half		.925
CG		8.5
		7.575

M.D : Radius :: reſ. No. V.S. = Segment
27.15 : 100 :: 7.575 : .279 = .228
And *Contents* 102.63 × .228 = 23.399 *A. G.*

When the *Dry Inches* are { *leſs* than / *more* than / *equal* to } *Semi-Diff.* of *Diam.* the *Liquors Surface* { *cuts not* / *cuts* / *touches* } the *Heads.* NB.

LIX. Prob. *By the Dimenſions: to find the Content of a* Maſh-Tun.

To the *Area* of the *Mean Diameter* of the *Goods uſually wet* add *two Tenths* of the ſame, the *Sum* drawn into the *Depth*, produces the *Content*.

But the *Surveyor* muſt alter the *Addend* according to the *Country Malt*, for his *Experience* in this caſe will be the beſt *Director*.

LX. Prob. *By the Dimenſions: to find the Content of a* Copper. *Fig.* XXV.

Quarter it, and take the *Diameters* in the *middle* of *every 6 Inches*, as alſo of the remaining *Fruſtum* (if any) *viz. fg, hi, kl*, then enter againſt each *Diameter* its proper *Area*, and multiply them ſeverally by 6; the *Total* of the *Products* more the *Liquor* lying about the *Crown* is the *whole Content*.

☞ And taking CDNP as the Fruſtum of a *Parabolick Conoid*, and PVN as the Fruſtum of a *Sphere* then: Mr. *Ward.*

⊙CD − $\frac{4}{5}$ ⊙VS × $\frac{1}{2}$ V.S = Liquor about the Crown.

Circles Area in *Ale-Gallons.*

Diam.	0	1	2	3	4
1	0.0028	0.0034	0.0040	0.0047	0.0055
2	0.0111	0.0123	0.0135	0.0147	0.0160
3	0.0251	0.0268	0.0285	0.0303	0.0322
4	0.0446	0.0468	0.0491	0.0515	0.0539
5	0.0696	0.0724	0.0753	0.0782	0.0812
6	0.1003	0.1036	0.1071	0.1105	0.1141
7	0.1365	0.1404	0.1444	0.1484	0.1525
8	0.1782	0.1827	0.1873	0.1919	0.1965
9	0.2256	0.2306	0.2357	0.2409	0.2461
10	0.2785	0.2841	0.2898	0.2955	0.3012
11	0.3370	0.3432	0.3494	0.3556	0.3620
12	0.4011	0.4078	0.4145	0.4214	0.4282
13	0.4707	0.4780	0.4853	0.4927	0.5001
14	0.5459	0.5537	0.5616	0.5695	0.5775
15	0.6266	0.6350	0.6435	0.6520	0.6605
16	0.7130	0.7219	0.7309	0.7400	0.7491
17	0.8049	0.8144	0.8239	0.8336	0.8432
18	0.9024	0.9124	0.9225	0.9327	0.9429
19	1.0054	1.0160	1.0267	1.0374	1.0482
20	1.1140	1.1251	1.1364	1.1477	1.1590
21	1.2282	1.2400	1.2517	1.2636	1.2755
22	1.3480	1.3603	1.3726	1.3850	1.3975
23	1.4733	1.4862	1.4991	1.5120	1.5250
24	1.6042	1.6176	1.6311	1.6446	1.6581
25	1.7407	1.7546	1.7686	1.7827	1.7968
26	1.8827	1.8972	1.9118	1.9264	1.9411
27	2.0303	2.0454	2.0605	2.0757	2.0909
28	2.1835	2.1991	2.2148	2.2306	2.2464
29	2.3423	2.3585	2.3747	2.3910	2.4073
30	2.5066	2.5233	2.5401	2.5570	2.5739

Circles Areas in *Ale-Gallons.*

Diam.	5	6	7	8	9
1	0.0063	0.0071	0.0080	0.0090	0.0101
2	0.0174	0.0188	0.0203	0.0218	0.0234
3	0.0341	0.0361	0.0381	0.0402	0.0424
4	0.0564	0.0589	0.0615	0.0642	0.0669
5	0.0842	0.0873	0.0905	0.0937	0.0969
6	0.1177	0.1213	0.1250	0.1288	0.1326
7	0.1567	0.1609	0.1651	0.1694	0.1738
8	0.2012	0.2060	0.2108	0.2157	0.2206
9	0.2514	0.2567	0.2621	0.2675	0.2730
10	0.3071	0.3129	0.3189	0.3249	0.3309
11	0.3683	0.3748	0.3813	0.3878	0.3944
12	0.4352	0.4422	0.4492	0.4563	0.4635
13	0.5076	0.5151	0.5227	0.5304	0.5381
14	0.5856	0.5937	0.6018	0.6100	0.6183
15	0.6691	0.6778	0.6865	0.6953	0.7041
16	0.7582	0.7675	0.7767	0.7861	0.7955
17	0.8529	0.8627	0.8725	0.8824	0.8924
18	0.9532	0.9635	0.9739	0.9884	0.9949
19	1.0590	1.0699	1.0808	1.0919	1.1029
20	1.1704	1.1819	1.1934	1.2049	1.2166
21	1.2874	1.2994	1.3115	1.3236	1.3358
22	1.4100	1.4225	1.4351	1.4478	1.4605
23	1.5381	1.5512	1.5644	1.5776	1.5909
24	1.6718	1.6854	1.6992	1.7129	1.7268
25	1.8110	1.8252	1.8395	1.8539	1.8683
26	1.9558	1.9706	1.9855	2.0004	2.0153
27	2.1062	2.1216	2.1370	2.1524	2.1679
28	2.2622	2.2781	2.2941	2.3101	2.3261
29	2.4237	2.4402	2.4567	2.4733	2.4899
30	2.5908	2.6079	2.6249	2.6421	2.6592

Circles Areas in *Ale-Gallons*.

Dia.	0	1	2	3	4
31	2.6765	2.6938	2.7111	2.7285	2.7460
32	2.8519	2.8698	2.8877	2.9057	2.9237
33	3.0330	3.0514	3.0698	3.0884	3.1069
34	3.2196	3.2385	3.2576	3.2766	3.2958
35	3.4117	3.4313	3.4509	3.4705	3.4902
36	3.6095	3.6296	3.6497	3.6699	3.6901
37	3.8128	3.8334	3.8541	3.8749	3.8957
38	4.0217	4.0429	4.0641	4.0854	4.1068
39	4.2361	4.2579	4.2797	4.3016	4.3235
40	4.4562	4.4785	4.5008	4.5233	4.5457
41	4.6818	4.7046	4.7275	4.7505	4.7735
42	4.9129	4.9363	4.9598	4.9834	5.0069
43	5.1456	5.1736	5.1977	5.2218	5.2459
44	5.3920	5.4165	5.4411	5.4657	5.4904
45	5.6398	5.6649	5.6901	5.7153	5.7405
46	5.8933	5.9189	5.9446	5.9704	5.9962
47	6.1523	6.1785	6.2048	6.2311	6.2575
48	6.4169	6.4436	6.4705	6.4973	6.5243
49	6.6870	6.7143	6.7417	6.7692	6.7966
50	6.9628	6.9906	7.0186	7.0466	7.0746
51	7.2440	7.2725	7.3010	7.3295	7.3581
52	7.5309	7.5599	7.5890	7.6181	7.6472
53	7.8233	7.8529	7.8825	7.9122	7.9419
54	8.1214	8.1515	8.1816	8.2118	8.2421
55	8.4249	8.4556	8.4863	8.5171	8.5479
56	8.7341	8.7653	8.7966	8.8279	8.8593
57	9.0488	9.0806	9.1124	9.1443	9.1762
58	9.3691	9.4014	9.4338	9.4662	9.4988
59	9.6949	9.7278	9.7608	9.7938	9.8268
60	10.0264	10.0598	10.0933	10.1269	10.1605

Circles Areas in *Ale-Gallons.*

Dia.	5	6	7	8	9
31	2.7635	2.7811	2.7987	2.8164	2.8341
32	2.9418	2.9599	2.9781	2.9963	3.0146
33	3.1256	3.1443	3.1630	3.1818	3.2007
34	3.3150	3.3342	3.3535	4.3729	3.3923
35	3.5099	3.5297	3.5496	4.5695	3.5895
36	3.7104	3.7308	3.7512	3.7717	3.7922
37	3.9165	3.9375	3.9584	3.9795	4.0005
38	4.1282	4.1497	4.1712	4.1928	4.2144
39	4.3455	4.3675	4.3896	4.4117	4.4339
40	4.5683	4.5908	4.6135	4.6362	4.6589
41	4.7966	4.8198	4.8430	4.8662	4.8895
42	5.0306	5.0543	5.0780	5.1019	5.1257
43	5.2701	5.2944	5.3187	5.3430	5.3675
44	5.5152	5.5400	5.5649	5.5898	5.6148
45	5.7659	5.7912	5.8167	5.8421	5.8677
46	6.0221	6.0480	6.0750	6.1000	6.1261
47	6.2839	6.3104	6.3369	6.3635	6.3902
48	6.5513	6.5783	6.6054	6.6325	6.6598
49	6.8242	6.8518	6.8794	6.9072	6.9349
50	7.1027	7.1309	7.1591	7.1873	7.2157
51	7.3868	7.4155	7.4443	7.4731	7.5020
52	7.6764	7.7057	7.7350	7.7644	7.7939
53	7.9717	8.0015	8.0314	8.0613	8.0913
54	8.2724	8.3028	8.3333	8.3638	8.3943
55	8.5788	8.6097	8.6407	8.6718	8.7029
56	8.8907	8.9222	8.9538	8.9854	9.0171
57	9.2082	9.2403	9.2724	9.3046	9.3368
58	9.5313	9.5639	9.5966	9.6293	9.6621
59	9.8600	9.8931	9.9263	9.9596	9.9930
60	10.1942	10.2279	10.2617	10.2955	10.3294

Circles Areas in *Wine-Gallons.*

Diam.	0	1	2	3	4
1	0.0034	0.0041	0.0049	0.0057	0.0067
2	0.0136	0.0150	0.0165	0.0180	0.0196
3	0.0306	0.0327	0.0348	0.0370	0.0393
4	0.0544	0.0572	0.0600	0.0629	0.0658
5	0.0850	0.0884	0.0919	0.0955	0.0991
6	0.1224	0.1265	0.1307	0.1349	0.1393
7	0.1666	0.1714	0.1763	0.1812	0.1862
8	0.2176	0.2231	0.2286	0.2342	0.2399
9	0.2754	0.2816	0.2878	0.2941	0.3004
10	0.3400	0.3468	0.3537	0.3607	0.3677
11	0.4114	0.4189	0.4265	0.4341	0.4419
12	0.4896	0.4978	0.5061	0.5144	0.5228
13	0.5746	0.5835	0.5924	0.6014	0.6105
14	0.6664	0.6760	0.6856	0.6953	0.7050
15	0.7650	0.7752	0.7855	0.7959	0.8063
16	0.8704	0.8813	0.8923	0.9033	0.9145
17	0.9826	0.9942	1.0059	1.0176	1.0294
18	1.1016	1.1139	1.1262	1.1386	1.1511
19	1.2274	1.2404	1.2534	1.2665	1.2796
20	1.3600	1.3736	1.3837	1.4011	1.4149
21	1.4994	1.5137	1.5281	1.5425	1.5571
22	1.6456	1.6606	1.6757	1.6908	1.7060
23	1.7986	1.8143	1.8300	1.8458	1.8617
24	1.9584	1.9748	1.9912	2.0077	2.0242
25	2.1250	2.1420	2.1591	2.1763	2.1935
26	2.2984	2.3161	2.3339	2.3517	2.3697
27	2.4786	2.4970	2.5155	2.5340	2.5526
28	2.6656	2.6847	2.7038	2.7230	2.7423
29	2.8594	2.8792	2.8990	2.9189	2.9388
30	3.0600	3.0804	3.1009	3.1215	3.1421

Circles Areas in *Wine-Gallons.*

Diam.	5	6	3	4	9
1	0.0077	0.0087	0.0098	0.0110	0.0123
2	0.0213	0.0230	0.0248	0.0267	0.0286
3	0.0417	0.0441	0.0465	0.0491	0.0517
4	0.0689	0.0719	0.0751	0.0781	0.0816
5	0.1029	0.1066	0.1105	0.1144	0.1184
6	0.1437	0.1481	0.1526	0.1572	0.1619
7	0.1913	0.1964	0.2016	0.2069	0.2122
8	0.2457	0.2515	0.2573	0.2633	0.2693
9	0.3069	0.3133	0.3199	0.3265	0.3332
10	0.3749	0.3820	0.3893	0.3966	0.4040
11	0.4497	0.4575	0.4654	0.4734	0.4815
12	0.5313	0.5398	0.5484	0.5571	0.5658
13	0.6197	0.6289	0.6381	0.6475	0.6569
14	0.7149	0.7247	0.7347	0.7447	0.7548
15	0.8169	0.8274	0.8381	0.8488	0.8596
16	0.9257	0.9369	0.9442	0.9596	0.9711
17	1.0413	1.0532	1.0652	1.0773	1.0894
18	1.1637	1.1763	1.1889	1.2017	1.2145
19	1.2929	1.3061	1.3195	1.3329	1.3464
20	1.4289	1.4428	1.4569	1.4710	1.4852
21	1.5717	1.5863	1.6010	1.6158	1.6307
22	1.7213	1.7366	1.7520	1.7675	1.7830
23	1.8777	1.8937	1.9097	1.9259	1.9421
24	2.0409	2.0575	2.0743	2.0911	2.1080
25	2.2109	2.2282	2.2457	2.2632	2.2808
26	2.3877	2.4057	2.4238	2.4420	2.4603
27	2.5713	2.5900	2.6088	2.6277	2.6466
28	2.7617	2.7811	2.8005	2.8201	2.8396
29	2.9589	2.9789	2.9991	3.0193	3.0396
30	3.1629	3.1836	3.2045	3.2254	3.2464

Circles Areas in *Wine-Gallons.*

Di.	0	1	2	3	4
31	3.2674	3.2885	3.3097	3.3309	3.3523
32	3.4816	3.5034	3.5253	3.5472	3.5692
33	3.7026	3.7251	3.7476	3.7702	3.7929
34	3.9304	3.9536	3.9768	4.0001	4.0234
35	4.1650	4.1888	4.2127	4.2367	4.2607
36	4.4064	4.4309	4.4555	4.4801	4.5049
37	4.6546	4.6798	4.7051	4.7304	4.7558
38	4.9096	4.9355	4.9614	4.9874	5.0135
39	5.1714	5.1980	5.2246	5.2513	5.2780
40	5.4400	5.4672	5.4945	5.5219	5.5493
41	5.7154	5.7433	5.7713	5.7993	5.8275
42	5.9976	6.0262	6.0549	6.0836	6.1124
43	6.2866	6.3159	6.3452	6.3746	6.4041
44	6.5824	6.6124	6.6424	6.6725	6.7026
45	6.8850	6.9156	6.9463	6.9771	7.0079
46	7.1944	7.2257	7.2571	7.2885	7.3201
47	7.5106	7.5426	7.5747	7.6068	7.6390
48	7.8336	7.8663	7.8990	7.9318	7.9647
49	8.1634	8.1968	8.2302	8.2637	8.2972
50	8.5000	8.5340	8.5681	8.6023	8.6365
51	8.8434	8.8781	8.9129	8.9477	8.9827
52	9.1936	9.2290	9.2645	9.3000	9.3356
53	9.5506	9.5867	9.6228	9.6590	9.6953
54	9.9144	9.9512	9.9880	10.0249	10.0618
55	10.2850	10.3224	10.3599	11.3975	10.4351
56	10.6624	10.7005	10.7387	10.7769	10.8153
57	11.0466	11.0854	11.1243	11.1632	11.2022
58	11.4376	11.4771	11.5166	11.5562	11.5959
59	11.8354	11.8756	11.9158	11.9561	11.9964
60	12.2400	12.2808	12.3217	12.3627	12.4037

Circles Areas in *Wine-Gallons.*

Dia.	5	6	7	8	9
31	3.3737	3.3951	3.4166	3.4382	3.4599
32	3.5913	3.6134	3.6356	3.6579	3.6802
33	3.8157	3.8385	3.8613	3.8843	3.9073
34	4.0469	4.0703	4.0939	4.1175	4.1412
35	4.2849	4.3090	4.3333	4.3576	4.3820
36	4.5297	4.5545	4.5794	4.6044	4.6295
37	4.7813	4.8068	4.8324	4.8585	4.8838
38	5.0397	4.0659	5.0921	5.1185	5.1449
39	5.3049	5.3317	5.3587	5.3857	5.4128
40	5.5769	5.6044	5.6321	5.6598	5.6876
41	5.8557	5.8839	5.9122	5.9406	5.9691
42	6.1413	6.1702	6.1992	6.2283	6.2574
43	6.4337	6.4633	6.4929	6.5227	6.5525
44	6.7329	6.7631	6.7935	6.8239	6.8544
45	7.0389	7.0698	7.1009	7.1320	7.1632
46	7.3517	7.3833	7.4150	7.4468	7.4787
47	7.6713	7.7036	7.7360	7.7685	7.8010
48	7.9977	8.0307	8.0637	8.0969	8.1301
49	8.3309	8.3645	8.3983	8.4321	8.4660
50	8.6709	8.7052	8.7397	8.7742	8.8088
51	9.0177	9.0527	9.0878	9.1230	9.1583
52	9.3713	9.4070	9.4428	9.4787	9.5146
53	9.7317	9.7681	9.8045	9.8411	9.8777
54	10.0989	10.1359	10.1731	10.2103	10.2476
55	10.4729	10.5106	10.5485	10.5864	10.6244
56	10.8537	10.8921	10.9306	10.9692	11.0079
57	11.2413	11.2804	11.3196	11.3589	11.3982
58	11.6357	11.6755	11.7153	11.7553	11.7953
59	12.0369	12.0773	12.1179	12.1585	12.1992
60	12.4449	12.4860	12.5273	12.5686	12.6100

SEGMENTS
Of a
CIRCLE,

Whose DIAMETER 1.128379 is divided by parallel *Chord-Lines* into 100 equal parts, and the *Area* 1.0000.

Calculated by *Sybrand Hans.*

V. S.	*Segm.*	V. S.	*Segm.*	V. S.	*Segm.*	V. S.	*Segm.*
.1	.0017	.26	.2066	.51	.5127	.76	.8155
.2	.0048	.27	.2178	.52	.5255	.77	.8262
.3	.0087	.28	.2292	.53	.5382	.78	.8369
.4	.0134	.29	.2407	.54	.5509	.79	.8473
.5	.0187	.30	.2523	.55	.5636	.80	.8576
.6	.0245	.31	.2640	.56	.5762	.81	.8677
.7	.0308	.32	.2759	.57	.5888	.82	.8776
.8	.0375	.33	.2878	.58	.6014	.83	.8873
.9	.0446	.34	.2998	.59	.6140	.84	.8967
.10	.0520	.35	.3119	.60	.6265	.85	.9059
.11	.0598	.36	.3241	.61	.6389	.86	.9149
.12	.0680	.37	.3364	.62	.6513	.87	.9236
.13	.0764	.38	.3487	.63	.6636	.88	.9320
.14	.0851	.39	.3611	.64	.6759	.89	.9402
.15	.0941	.40	.3735	.65	.6881	.90	.9480
.16	.1033	.41	.3860	.66	.7002	.91	.9554
.17	.1127	.42	.3986	.67	.7122	.92	.9625
.18	.1224	.43	.4112	.68	.7241	.93	.9692
.19	.1323	.44	.4238	.69	.7360	.94	.9755
.20	.1424	.45	.4364	.70	.7477	.95	.9813
.21	.1527	.46	.4491	.71	.7593	.96	.9866
.22	.1631	.47	.4618	.72	.7708	.97	.9913
.23	.1738	.48	.4745	.73	.7822	.98	.9952
.24	.1845	.49	.4873	.74	.7934	.99	.9983
.25	.1955	.50	.5000	.75	.8045	1.00	1.0000

A TABLE for finding the PERIFERY Of an ELLIPSIS.

Calculated by Sir *Jonas Moore*.

Axe	Perif.	Axe	Perif.	Axe	Perif.	Axe	Perif.
.1	2.0012	.26	2.1561	.51	2.4342	.76	2.7745
.2	2.0028	.27	2.1658	.52	2.4467	.77	2.7891
.3	2.0048	.28	2.1756	.53	2.4594	.78	2.8038
.4	2.0072	.29	2.1856	.54	2.4723	.79	2.8186
.5	2.0100	.30	2.1956	.55	2.4852	.80	2.8334
.6	2.0133	.31	2.2057	.56	2.4983	.81	2.8482
.7	2.0170	.32	2.2160	.57	2.5114	.82	2.8630
.8	2.0213	.33	2.2264	.58	2.5245	.83	2.8779
.9	2.0261	.34	2.2368	.59	2.5377	.84	2.8929
.10	2.0314	.35	2.2474	.60	2.5510	.85	2.9080
.11	2.0370	.36	2.2581	.61	2.5644	.86	2.9231
.12	2.0432	.37	2.2692	.62	2.5779	.87	2.9382
.13	2.0496	.38	2.2803	.63	2.5915	.88	2.9534
.14	2.0564	.39	2.2915	.64	2.6052	.89	2.9686
.15	2.0634	.40	2.3028	.65	2.6189	.90	2.9839
.16	2.0708	.41	2.3142	.66	2.6327	.91	2.9993
.17	2.0784	.42	2.3256	.67	2.6465	.92	3.0147
.18	2.0862	.43	2.3371	.68	2.6604	.93	3.0302
.19	2.0944	.44	2.3488	.69	2.6744	.94	3.0458
.20	2.1024	.45	2.3607	.70	2.6884	.95	3.0614
.21	2.1106	.46	2.3726	.71	2.7025	.96	3.0771
.22	2.1192	.47	2.3848	.72	2.7166	.97	3.0928
.23	2.1281	.48	2.3970	.73	2.7309	.98	3.1086
.24	2.1373	.49	2.4094	.74	2.7453	.99	3.1244
.25	2.1467	.50	2.4218	.75	2.7599	1.00	3.1402

SEGMENTS Of a CONE,

Whose AXE is divided by *Planes* parallel to the *Base* into 100 equal parts, and the *Solid Content* 1.0000.

S.A.	*Segm.*	S.A.	*Segm.*	S.A.	*Segm.*	S.A.	*Segm.*
.1	.0002	.26	.0177	.51	.1327	.76	.4390
.2	.0003	.27	.0198	.52	.1407	.77	.4565
.3	.0003	.28	.0221	.53	.1489	78	.4746
.4	.0004	.29	.0245	.54	.1575	.79	.4930
.5	.0004	.30	.0271	.55	.1664	.80	.5120
.6	.0005	.31	.0299	.56	.1757	.81	.5314
.7	.0006	.32	.0329	.57	.1852	.82	.5514
.8	.0008	.33	.0360	.58	.1951	.83	.5718
.9	.0010	.34	.0394	.59	.2054	.84	.5927
.10	.0012	.35	.0430	.60	.2160	.85	.6141
.11	.0016	.36	.0467	.61	.2270	.86	.6361
.12	.0020	.37	.0507	.62	.2384	.87	.6585
.13	.0024	.38	.0550	.63	.2501	.88	.6815
.14	.0030	.39	.0594	.64	.2622	.89	.7050
.15	.0036	.40	.0641	.65	.2746	.90	.7290
.16	.0043	.41	.0690	.66	.2875	.91	.7536
.17	.0051	.42	.0742	.67	.3008	.92	.7787
.18	.0060	.43	.0796	.68	.3144	.93	.8044
.19	.0070	.44	.0852	.69	.3285	.94	.8306
.20	.0082	.45	.0912	.70	.3430	.95	.8574
.21	.0094	.46	.0974	.71	.3579	.96	.8847
.22	.0108	.47	.1039	.72	.3733	.97	.9127
.23	.0123	.48	.1106	.73	.3890	.98	.9412
.24	.0140	.49	.1177	.74	.4052	.99	.9703
.25	.0158	.50	.1250	.75	.4219	1.00	1.0000

SEGMENTS
Of a
Parabolick-CONOID

Whose AXE is divided by *Planes* parallel to the BASE into 100 equal Parts, and the *Solid Content* 1.0000.

S.A.	Segm.	S.A.	Segm.	S.A.	Segm.	S.A.	Segm.
.1	.0001	.26	.0676	.51	.2601	.76	.5776
.2	.0004	.27	.0729	.52	.2704	.77	.5929
.3	.0009	.28	.0784	.53	.2809	.78	.6084
.4	.0016	.29	.0841	.54	.2916	.79	.6241
.5	.0025	.30	.0900	.55	.3025	.80	.6400
.6	.0036	.31	.0961	.56	.3136	.81	.6561
.7	.0049	.32	.1024	.57	.3249	.82	.6724
.8	.0064	.33	.1089	.58	.3364	.83	.6889
.9	.0081	.34	.1156	.59	.3481	.84	.7056
.10	.0100	.35	.1225	.60	.3600	.85	.7225
.11	.0121	.36	.1296	.61	.3721	.86	.7396
.12	.0144	.37	.1369	.62	.3844	.87	.7569
.13	.0169	.38	.1444	.63	.3969	.88	.7744
.14	.0196	.39	.1521	.64	.4096	.89	.7921
.15	.0225	.40	.1600	.65	.4225	.90	.8100
.16	.0256	.41	.1681	.66	.4356	.91	.8281
.17	.0289	.42	.1764	.67	.4489	.92	.8464
.18	.0324	.43	.1849	.68	.4624	.93	.8649
.19	.0361	.44	.1936	.69	.4761	.94	.8836
.20	.0400	.45	.2025	.70	.4900	.95	.9025
.21	.0441	.46	.2116	.71	.5041	.96	.9216
.22	.0481	.47	.2209	.72	.5184	.97	.9409
.23	.0529	.48	.2304	.73	.5329	.98	.9604
.24	.0576	.49	.2401	.74	.5476	.99	.9801
.25	.0625	.50	.2500	.75	.5625	1.00	1.0000

SEGMENTS

Of the *Fruſtum* of a

CONE,

Whoſe AXE is divided by *Planes* parallel to the BASE into 100 equal parts, and the *Solid Content* 1.0000.

Calculated by Mr. *Rich. Coſſen.*

S.A.	1	2	3	4	S.A.	1	2	3	4
.1	0092	0087	0083	0078	.21	1973	1886	1804	1728
.2	0185	0175	0165	0157	.22	2069	1979	1854	1815
.3	0278	0263	0249	0236	.23	2165	2071	1984	1903
.4	0371	0351	0332	0315	.24	2261	2164	2074	1950
.5	0464	0439	0416	0395	.25	2357	2258	2165	2079
.6	0557	0528	0500	0475	.26	2453	2351	2256	2167
.7	0650	0617	0585	0556	.27	2549	2445	2348	2256
.8	0744	0706	0670	0637	.28	2646	2539	2439	2346
.9	0838	0795	0755	0718	.29	2743	2633	2531	2436
.10	0932	0884	0841	0800	.30	2839	2728	2624	2526
.11	1025	0974	0927	0882	.31	2936	2823	2717	2616
.12	1120	1064	1013	0965	.32	3033	2918	2810	2708
.13	1214	1155	1100	1048	.33	3131	3013	2903	2800
.14	1308	1245	1186	1132	.34	3228	3109	2997	2892
.15	1403	1336	1274	1216	.35	3326	3205	3091	2985
.16	1498	1427	1361	1300	.36	3423	3301	3186	3078
.17	1592	1518	1449	1385	.37	3521	3397	3281	3171
.18	1687	1610	1538	1417	.38	3619	3494	3376	3265
.19	1783	1702	1626	1556	.39	3718	3591	3472	3360
.20	1878	1794	1715	1642	.40	3816	3688	3567	3454

Segments of the *Frustum* of a *Cone.*

S.A.	1	2	3	4	S.A.	1	2	3	4
.41	3914	3785	3664	3550	.71	6941	6829	6722	6621
.42	4013	3883	3760	3645	.72	7044	6934	6830	6730
.43	4112	3981	3857	3742	.73	7148	7040	6938	6841
.44	4211	4079	3954	3838	.74	7251	7146	7046	6951
.45	4310	4177	4053	3935	.75	7355	7252	7155	7063
.46	4409	4276	4151	4033	.76	7459	7359	7264	7174
.47	4509	4375	4249	4131	.77	7563	7466	7374	7286
.48	4608	4474	4348	4229	.78	7667	7573	7484	7398
.49	4708	4574	4447	4328	.79	7771	7681	7594	7512
.50	4808	4673	4547	4427	.80	7876	7788	7705	7625
.51	4908	4773	4647	4527	.81	7981	7896	7816	7739
.52	5008	4874	4748	4628	.82	8086	8004	7927	7854
.53	5108	4974	4848	4728	.83	8191	8113	8039	7969
.54	5209	5075	4949	4829	.84	8296	8222	8151	8084
.55	5309	5176	5050	4931	.85	8401	8331	8264	8200
.56	5410	5277	5152	5033	.86	8507	8440	8377	8317
.57	5511	5379	5254	5136	.87	8612	8550	8490	8434
.58	5612	5481	5356	5239	.88	8718	8660	8604	8551
.59	5714	5583	5459	5342	.89	8824	8770	8718	8669
.60	5815	5685	5562	5446	.90	8930	8880	8833	8788
.61	5917	5788	5665	5550	.91	9036	8991	8948	8906
.62	6018	5891	5770	5655	.92	9143	9102	9063	9026
.63	6120	5994	5874	5761	.93	9249	9213	9179	9147
.64	6222	6097	5979	5867	.94	9356	9325	9295	9266
.65	6324	6201	6084	5973	.95	9463	9437	9412	9387
.66	6427	6305	6189	6080	.96	9570	9549	9528	9509
.67	6529	6409	6295	6187	.97	9677	9661	9646	9631
.68	6632	6513	6401	6295	.98	9785	9774	9763	9753
.69	6735	6618	6508	6403	.99	9892	9887	9882	9876
.70	6838	6723	6615	6512	1.00	1.0000	1.0000	1.0000	1.0000

SEGMENTS
Of a
Parabolick SPINDLE,

Whose AXE is divided by *Planes* parallel to the BUNG-DIAMETER into 100 equal parts, and the *Solid Content* 1.0000.

S.A.	*Segm.*	S.A.	*Segm.*	S.A.	*Segm.*	S.A.	*Segm.*
.1	.0000	.25	.1143	.51	.5188	.76	.9067
.2	.0001	.27	.1257	.52	.5375	.77	.9164
.3	.0003	.28	.1376	.53	.5561	.78	.9255
.4	.0006	.29	.1501	.54	.5747	.79	.9340
.5	.0012	.30	.1630	.55	.5931	.80	.9420
.6	.0020	.31	.1765	.56	.6114	.81	.9494
.7	.0031	.32	.1905	.57	.6296	.82	.9563
.8	.0046	.33	.2049	.58	.6475	.83	.9626
.9	.0064	.34	.2198	.59	.6651	.84	.9683
.10	.0086	.35	.2352	.60	.6826	.85	.9734
.11	.0113	.36	.2509	.61	.6997	.86	.9780
.12	.0144	.37	.2670	.62	.7165	.87	.9821
.13	.0179	.38	.2835	.63	.7330	.88	.9856
.14	.0220	.39	.3003	.64	.7491	.89	.9887
.15	.0266	.40	.3174	.65	.7648	.90	.9914
.16	.0317	.41	.3349	.66	.7802	.91	.9936
.17	.0374	.42	.3525	.67	.7951	.92	.9954
.18	.0437	.43	.3704	.68	.8095	.93	.9967
.19	.0506	.44	.3886	.69	.8235	.94	.9978
.20	.0580	.45	.4069	.70	.8370	.95	.9988
.21	.0660	.46	.4253	.71	.8499	.96	.9994
.22	.0745	.47	.4439	.72	.8624	.97	.9997
.23	.0836	.48	.4625	.73	.8743	.98	.9999
.24	.0933	.49	.4812	.74	.8857	.99	.0000
.25	.1035	.50	.5000	.75	.8965		

SEGMENTS Of a SPHERE,

Whose AXE 1.240695 is divided by parallel *Planes* into 100 equal parts, and the *Solid Content* 1.0000.

S.A.	*Segm.*	S.A.	*Segm.*	S.A.	*Segm.*	S.A.	*Segm.*
.1	.0003	.26	.1677	.51	.5150	.76	.8548
.2	.0012	.27	.1793	.52	.5300	.77	.8656
.3	.0027	.28	.1913	.53	.5449	.78	.8761
.4	.0047	.29	.2036	.54	.5599	.79	.8862
.5	.0073	.30	.2161	.55	.5747	.80	.8960
.6	.0104	.31	.2287	.56	.5896	.81	.9054
.7	.0140	.32	.2417	.57	.6043	.82	.9145
.8	.0182	.33	.2548	.58	.6190	.83	.9231
.9	.0228	.34	.2682	.59	.6335	.84	.9314
.10	.0280	.35	.2818	.60	.6480	.85	.9392
.11	.0336	.36	.2955	.61	.6623	.86	.9467
.12	.0397	.37	.3094	.62	.6765	.87	.9537
.13	.0463	.38	.3235	.63	.6906	.88	.9603
.14	.0533	.39	.3377	.64	.7045	.89	.9664
.15	.0608	.40	.3520	.65	.7182	.90	.9720
.16	.0686	.41	.3665	.66	.7318	.91	.9772
.17	.0769	.42	.3810	.67	.7452	.92	.9818
.18	.0855	.43	.3957	.68	.7583	.93	.9860
.19	.0946	.44	.4104	.69	.7713	.94	.9856
.20	.1040	.45	.4253	.70	.7839	.95	.9927
.21	.1138	.46	.4401	.71	.7964	.96	.9953
.22	.1239	.47	.4551	.72	.8087	.97	.9973
.23	.1344	.48	.4700	.73	.8207	.98	.9988
.24	.1452	.49	.4850	.74	.8323	.99	.9997
.25	.1563	.50	.5000	.75	.8437	1.00	1.0000

SEGMENTS

Of the *middle Fruſtum* of a

SPHEROID.

Whoſe AXE is divided by Planes parallel to the BUNG-DIAMETER into 100 equal parts, and the *Solid Content* 1.0000.

Calculated by Mr. *Rich. Colſton.*

S.A.	1	2	3	4	S.A.	1	2	3	4
.1	0090	0084	0078	0073	.21	2004	1940	1882	1829
.2	0181	0169	0157	0147	.22	2104	2040	1982	1930
.3	0273	0254	0238	0223	.23	2205	2141	2083	2031
.4	0365	0341	0320	0301	.24	2305	2242	2185	2133
.5	0457	0429	0403	0380	.25	2406	2344	2287	2236
.6	0550	0517	0487	0460	.26	2508	2446	2391	2340
.7	0644	0607	0573	0542	.27	2609	2549	2494	2445
.8	0738	0697	0660	0626	.28	2711	2652	2599	2550
.9	0833	0788	0748	0711	.29	2814	2756	2704	2657
.10	0928	0880	0837	0797	.30	2916	2860	2810	2764
.11	1024	0973	0927	0885	.31	3019	2965	2916	2871
.12	1120	1066	1018	0974	.32	3122	3070	3022	2980
.13	1216	1161	1110	1064	.33	3225	3175	3130	3088
.14	1313	1256	1203	1156	.34	3328	3280	3237	3198
.15	1411	1351	1298	1249	.35	3432	3386	3345	3308
.16	1509	1448	1393	1343	.36	3536	3492	3454	3418
.17	1607	1545	1489	1438	.37	3639	3599	3563	3529
.18	1706	1643	1586	1534	.38	3744	3706	3672	3641
.19	1805	1741	1684	1631	.39	3848	3813	3781	3753
.20	1904	1840	1782	1730	.40	3952	3920	3891	3865

Segm. of the *middle Fruſtum* of a *Spheroid.*

S.A.	1	2	3	4	S.A.	1	2	3	4
.41	4057	4027	4001	3978	.71	7186	7244	7296	7343
.42	4161	4135	4112	4090	.72	7289	7348	7401	7450
.43	4266	4243	4222	4203	.73	7391	7451	7506	7555
.44	4370	4351	4333	4317	.74	7492	7554	7609	7660
.45	4475	4459	4444	4430	.75	7594	7656	7713	7764
.46	4580	4567	4555	4544	.76	7695	7758	7815	7867
.47	4685	4675	4666	4658	.77	7795	7859	7917	7969
.48	4790	4783	4777	4772	.78	7896	7960	8018	8070
.49	4895	4891	4889	4886	.79	7996	8060	8118	8171
.50	5000	5000	5000	5000	.80	8096	8160	8218	8270
.51	5105	5109	5111	5114	.81	8195	8259	8316	8369
.52	5210	5217	5223	5228	.82	8294	8357	8414	8466
.53	5315	5325	5334	5342	.83	8393	8455	8511	8562
.54	5420	5433	5445	5456	.84	8491	8552	8607	8657
.55	5525	5541	5556	5570	.85	8589	8649	8702	8750
.56	5630	5649	5667	5683	.86	8687	8744	8797	8844
.57	5734	5757	5778	5797	.87	8784	8839	8890	8936
.58	5839	5865	5888	5910	.88	8880	8934	8982	9026
.59	5943	5973	5999	6022	.89	8976	9027	9073	9115
.60	6048	6080	6109	6135	.90	9072	9120	9163	9203
.61	6152	6187	6219	6247	.91	9167	9212	9252	9289
.62	6256	6294	6328	6359	.92	9262	9303	9340	9374
.63	6361	6401	6437	6471	.93	9356	9393	9427	9458
.64	6464	6508	6546	6582	.94	9450	9483	9513	9540
.65	6568	6614	6655	6692	.95	9543	9571	9597	9620
.66	6672	6720	6763	6802	.96	9635	9659	9680	9695
.67	6775	6825	6870	6912	.97	9727	9746	9762	9777
.68	6878	6930	6978	7020	.98	9819	9831	9843	9853
.69	6981	7035	7084	7129	.99	9910	9916	9922	9927
.70	7084	7140	7190	7236	1.00	1.0000	1.0000	1.0000	1.0000

Excise for Brewers ex Londino, &c. *at* 4*s.* per *Barr. the Allowances being* $2\frac{1}{2}$ *Bar. in every* 23.

Bar.	0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$
	l. s. d. q. 23	*l. s. d. q.* 23	*l. s. d. q.* 23	*l. s. d. q.* 23
0	———	0.00.10.2.18	0.01.09.1.13	0.02.08.0.08
1	0.03.05.3.03	0.04.05.1.21	0.05.04.0.16	0.06.02.3.11
2	0.07.01.2.06	0.08.00.1.01	0.08.10.3.19	0.09.09.2.14
3	0.10.08.1.09	0.11.07.0.04	0.12.05.2.22	0.13.04.1.17
4	0.14.03.0.12	0.15.01.3.07	0.16.02.0.02	0.16.11.0.20
5	0.17.09.3.15	0.18.08.2.10	0.19.07.1.05	1.00.06.0.00
6	1.01.04.2.18	1.02.03.1.13	1.03.02.0.08	1.04.00.3.03
7	1.04.11.1.21	1.05.10.0.16	1.06.08.3.11	1.07.07.2.06
8	1.08.06.1.01	1.09.04.3.19	1.10.03.2.14	1.11.02.1.09
9	1.12.01.0.04	1.12.11.2.22	1.13.10.1.17	1.14.09.0.12
10	1.15.07.3.07	1.16.06.2.02	1.17.05.0.20	1.18.03.3.15
11	1.19.02.2.10	2.00.01.1.05	2.01.00.0.00	2.01.10.2.18
12	2.02.09.1.13	2.03.08.0.08	2.04.06.3.03	2.05.05.1.21
13	2.06.04.0.16	2.07.02.3.11	2.08.01.2.06	2.09.00.1.01
	2.09.10.3.19	2.10.09.2.14	2.11.08.1.09	2.12.07.0.04
15	2.13.05.2.22	2.14.04.1.17	2.15.03.0.12	2.16.01.3.07
16	2.17.00.2.02	2.17.11.0.20	2.18.09.3.15	2.19.08.2.10
17	3.00.07.1.05	3.01.06.0.00	3.02.04.2.18	3.03.03.1.13
18	3.04.02.0.08	3.05.00.3.03	3.05.11.1.21	3.06.10.0.16
19	3.07.08.3.11	3.08.07.2.06	3.09.06.1.01	3.10.04.3.19
20	3.11.03.2.14	3.12.02.1.09	3.13.01.0.04	3.13.11.2.22
21	3.14.10.1.17	3.15.09.0.12	3.16.07.3.07	3.17.06.2.02
22	3.18.05.0.20	3.19.03.3.15	4.00.02.2.10	4.01.01.1.05
23	4.02.00.0.00	4.02.10.2.18	4.03.09.1.13	4.04.08.0.08
24	4.05.06.3.03	4.06.05.1.21	4.07.04.0.16	4.08.02.3.11
25	4.09.01.2.06	4.10.00.1.01	4.10.10.3.19	4.11.09.2.14
26	4.12.08.1.09	4.13.07.0.04	4.14.05.2.22	4.15.04.1.17
27	4.16.03.0.12	4.17.01.3.07	4.18.00.2.02	4.18.11.0.20
28	4.19.09.3.15	5.00.08.2.10	5.01.07.1.05	5.02.06.0.00
29	5.03.04.2.18	5.04.03.1.13	5.05.02.0.08	5.06.00.3.03
30	5.06.11.1.21	5.07.10.0.16	5.08.08.3.11	5.09.07.2.06

EXCISE
FOR
BREWERS *ex Londino, &c.*
at 4*s. per* Barrel.

The *Allowances* being 2½ Bar. in every 23.

Bar.	*l. s. d. q.* 23	Bar.	*l. s. d. q.* 23	Bar.	*l. s. d. q.* 23
30	05.06.11.1.21	930	165.15.07.3.07	1830	326.04.04.0.16
60	10.13.10.3.19	960	171.02.07.1.05	1860	331.11.03.2.14
90	16.00.10.1.17	990	176.09.06.3.03	1890	336.18.03.0.12
120	21.07.09.3.15	1020	181.10.06.1.01	1920	342.05.02.2.10
150	26.14.09.1.13	1050	187.03.05.2.22	1950	347.12.02.0.08
180	32.01.08.3.11	1080	192.10.05.0.20	1980	352.19.01.2.06
210	37.08.08.1.09	1110	197.17.04.2.18	2010	358.06.01.0.04
240	42.15.07.3.07	1140	203.04.04.0.16	2040	363.13.00.2.02
270	48.02.07.1.05	1170	208.11.03.2.14	2070	369.00.00.0.00
300	53.09.06.3.03	1200	213.18.03.0.12	2100	374.06.11.1.21
330	58.16.06.1.01	1230	219.05.02.2.10	2200	392.03.05.2.22
360	64.03.05.2.22	1260	224.12.02.0.08	2300	410.00.00.0.00
390	69.10.05.0.20	1290	229.19.01.2.06	2400	427.16.06.1.01
420	74.17.04.2.18	1320	235.06.01.0.04	2500	445.13.00.2.02
450	80.04.04.0.16	1350	240.13.00.2.02	2600	463.09.06.3.03
480	85.11.03.2.14	1380	246.00.00.0.00	2700	481.06.01.0.04
510	90.18.03.0.12	1410	251.06.11.1.21	2800	499.02.07.1.05
540	96.05.02.2.10	1440	256.13.10.3.19	2900	516.19.01.2.06
570	101.12.02.0.08	1470	262.00.10.1.17	3000	534.15.07.3.07
600	106.19.01.2.06	1500	267.07.09.3.15	4000	713.00.10.1.17
630	112.06.01.0.04	1530	272.14.09.1.13	5000	891.06.01.0.04
660	117.13.00.2.02	1560	278.01.08.3.11	6000	1069.11.03.2.14
690	123.00.00.0.00	1590	283.08.08.1.09	7000	1247.16.06.1.01
720	128.06.11.1.21	1620	288.15.07.3.07	8000	1426.01.08.3.11
750	133.13.10.3.19	1650	294.02.07.1.05	9000	1604.06.11.1.21
780	139.00.10.1.17	1680	299.09.06.3.03	10000	1782.12.02.0.08
810	144.07.09.3.15	1710	304.16.06.1.01	20000	3565.04.04.0.16
840	149.14.09.1.13	1740	310.03.05.2.22	30000	5347.16.06.1.01
870	155.01.08.3.11	1770	315.10.05.0.20	40000	7130.08.08.1.09
900	160.08.08.1.09	1800	320.17.04.2.18	50000	8912.00.10.1.17

Exciſe for Brewers ex Londino, &c. *at* 1*s.* per *Bar. the Allowances being* 2 ½ *Bar. in every* 23.

Ba.	0	¼	½	¾
	l. s. d. q. 23	*l. s. d. q.* 23	*l. s. d. q.* 23	*l. s. d. q.* 23
0	———	0.00.02.2.16	0.00.05.1.09	0.00.08.0.02
1	0.00.10.2.18	0.01.01.1.11	0.01.04.0.04	0.01.06.2.20
2	0.01.09.1.13	0.02.00.0.06	0.02.02.2.22	0.02.05.1.15
3	0.02.08.0.08	0.02.10.3.01	0.03.01.1.17	0.03.04.0.10
4	0.03.06.3.03	0.03.09.1.19	0.04.00.0.12	0.04.02.3.05
5	0.04.05.1.21	0.04.08.0.14	0.04.10.3.07	0.05.01.2.00
6	0.05.04.0.16	0.05.06.3.09	0.05.09.2.02	0.06.00.0.18
7	0.06.02.3.11	0.06.05.2.04	0.06.08.0.20	0.06.10.3.13
8	0.07.01.2.06	0.07.04.0.22	0.07.06.3.15	0.07.09.2.08
9	0.08.00.1.01	0.08.02.3.17	0.08.05.2.10	0.08.08.1.03
10	0.08.10.3.19	0.09.01.2.12	0.09.04.1.05	0.09.06.3.21
11	0.09.09.2.14	0.10.00.1.07	0.10.03.0.00	0.10.05.2.16
12	0.10.08.1.09	0.10.11.0.02	0.11.01.2.18	0.11.04.1.11
13	0.11.07.0.04	0.11.09.2.20	0.12.00.1.13	0.12.03.0.06
14	0.12.05.2.22	0.12.08.1.15	0.12.11.0.08	0.13.01.3.01
15	0.13.04.1.17	0.13.07.0.10	0.13.09.3.03	0.14.00.1.19
16	0.14.03.0.12	0.14.05.3.05	0.14.08.1.21	0.14.11.0.14
17	0.15.01.3.07	0.15.04.2.00	0.15.07.0.16	0.15.09.3.09
18	0.16.00.2.02	0.16.03.0.18	0.16.05.3.11	0.16.08.2.04
19	0.16.11.0.20	0.17.01.3.13	0.17.04.2.06	0.17.07.0.22
20	0.17.09.3.15	0.18.00.2.08	0.18.03.1.01	0.18.05.3.17
21	0.18.08.2.10	0.18.11.1.03	0.19.01.3.19	0.19.04.2.12
22	0.19.07.1.05	0.19.09.3.21	1.00.00.2.14	1.00.03.1.07
23	1.00.06.0.00	1.00.08.2.16	1.00.11.1.09	1.01.02.0.02
24	1.01.04.2.18	1.01.07.1.11	1.01.10.0.04	1.02.00.2.20
25	1.02.03.1.13	1.02.06.0.06	1.02.08.2.22	1.02.11.1.15
26	1.03.02.0.08	1.03.04.3.01	1.03.07.1.17	1.03.10.0.10
27	1.04.00.3.03	1.04.03.1.19	1.04.06.0.12	1.04.08.3.05
28	1.04.11.1.21	1.05.02.0.14	1.05.04.3.07	1.05.07.2.00
29	1.05.10.0.16	1.06.00.3.09	1.06.03.2.02	1.06.06.0.18
30	1.06.08.3.11	1.06.11.2.04	1.07.02.0.20	1.07.04.3.13

EXCISE FOR BREWERS *ex Londino*, &c. at 1 *s. per* Barrel.

The *Allowances* being $2\frac{1}{2}$ Bar. in every 23.

Bar.	*l. s. d. q.* 23	Bar.	*l. s. d. q.* 23	Bar.	*l. s. d. q.* 23
30	01.06.08.3.11	930	41.08.10.3.19	1830	81.11.01.0.04
60	02.13.05.1.22	960	42.15.07.3.07	1860	82.17.09.3.15
90	04.00.02.2.10	990	44.02.04.2.18	1890	84.04.06.3.03
120	05.06.11.1.21	1020	45.09.01.2.06	1920	85.11.03.2.14
150	06.13.08.1.09	1050	46.15.10.1.17	1950	86.18.00.2.02
180	08.00.05.0.20	1080	48.02.07.1.05	1980	88.04.09.1.13
210	09.07.02.0.08	1110	49.09.04.0.16	2010	89.11.06.1.01
240	10.13.10.3.19	1140	50.16.01.0.04	2040	90.18.03.0.12
270	12.00.07.3.07	1170	52.02.09.3.15	2070	92.05.00.0.00
300	13.07.04.2.18	1200	53.09.06.3.03	2100	93.11.68.3.11
330	14.14.01.2.06	1230	54.16.03.2.14	2100	98.00.10.1.17
360	16.00.10.1.17	1260	56.03.00.2.02	2300	102.10.00.0.00
390	17.07.07.1.05	1290	57.09.09.1.13	2400	106.19.01.2.06
420	18.14.04.0.16	1320	58.16.06.1.01	2500	111.08.03.0.12
450	20.01.01.0.04	1350	60.03.03.0.12	2600	115.17.04.2.18
480	21.07.09.3.15	1380	61.10.00.0.00	2700	120.06.06.1.01
510	22.14.06.3.03	1410	62.16.08.3.11	2800	124.19.07.3.07
540	24.01.03.2.14	1440	64.03.05.2.22	2900	129.04.09.1.13
570	25.08.00.2.02	1470	65.10.02.2.10	3000	133.13.10.3.19
600	26.14.09.1.13	1500	66.16.11.1.21	4000	178.05.02.2.10
630	28.01.06.1.01	1530	68.03.08.1.09	5000	222.16.06.1.01
660	29.08.03.0.12	1560	69.10.05.0.20	6000	267.07.09.3.15
690	30.15.00.0.00	1590	70.17.02.0.08	7000	311.19.01.2.06
720	32.01.08.3.11	1620	72.03.10.3.19	8000	356.10.05.0.20
750	33.08.05.2.22	1650	73.10.07.3.07	9000	401.01.08.3.11
780	34.15.02.2.10	1680	74.17.04.2.18	10000	445.12.00.2.02
810	36.01.11.1.21	1710	76.04.01.2.06	20000	891.06.01.0.04
840	37.08.08.1.09	1740	77.10.10.1.17	30000	1336.19.01.2.06
870	38.15.05.0.20	1770	78.17.07.1.05	40000	1782.12.01.0.08
900	40.02.02.0.08	1800	80.04.04.0.16	50000	2228.05.02.2.10

A TABLE *to convert* Barrels, *&c. into* Gallons, & cont:

B.	O	¼	½	¾	B.	O	¼	½	¾
1	34	42.5	51	59.5	31	1054	1062.5	1071	1079.5
2	68	76.5	85	93.5	32	1088	1096.5	1105	1113.5
3	102	110.5	119	127.5	33	1122	1130.5	1139	1147.5
4	136	144.5	153	161.5	34	1156	1164.5	1173	1181.5
5	170	178.5	187	195.5	35	1190	1198.5	1207	1215.5
6	204	212.5	221	229.5	36	1224	1232.5	1241	1249.5
7	238	246.5	255	263.5	37	1258	1266.5	1275	1283.5
8	272	280.5	289	297.5	38	1292	1300.5	1309	1317.5
9	306	314.5	323	331.5	39	1326	1334.5	1343	1351.5
10	340	348.5	357	365.5	40	1360	1368.5	1377	1385.5
11	374	382.5	391	399.5	41	1394	1402.5	1411	1419.5
12	408	416.5	425	433.5	42	1428	1436.5	1445	1453.5
13	442	450.5	459	467.5	43	1462	1470.5	1479	1487.5
14	476	484.5	493	501.5	44	1496	1504.5	1513	1521.5
15	510	518.5	527	535.5	45	1530	1538.5	1547	1555.5
16	544	552.5	561	569.5	46	1564	1572.5	1581	1589.5
17	578	586.5	595	603.5	47	1598	1606.5	1615	1623.5
18	612	620.5	629	647.5	48	1632	1640.5	1649	1657.5
19	646	654.5	663	671.5	49	1666	1674.5	1683	1691.5
20	680	688.5	697	705.5	50	1700	1708.5	1717	1725.5
21	714	722.5	731	739.5	51	1734	1742.5	1751	1759.5
22	748	756.5	765	773.5	52	1768	1776.5	1785	1793.5
23	782	790.5	799	807.5	53	1802	1810.5	1819	1827.5
24	816	824.5	833	841.5	54	1836	1844.5	1853	1861.5
25	850	858.5	867	875.5	55	1870	1878.5	1887	1895.5
26	884	892.5	901	909.5	56	1904	1912.5	1921	1929.5
27	918	926.5	935	943.5	57	1938	1946.5	1955	1963.5
28	952	960.5	969	977.5	58	1972	1980.5	1989	1997.5
29	986	994.5	1003	1011.5	59	2006	2014.5	2023	2031.5
30	1020	1028.5	1037	1045.5	60	2040	2048.5	2057	2065.5

A Synopsis Of the *Laws of Exciſe.*

BY ſeveral Acts of Parliament made in the Reigns of Their Majeſties *CHARLES* the Second, and *WILLIAM* and *MARY*, the Rates of Exciſe are as follow, *viz.*

	s.	d.	l.	s	d.	
Beer or Ale above 6 s. per *Barrel*	2	6	0	4	0	12. *Car.* II. 2. *Gul. & Mar.*
From Nov. 17. 1691. *for 4 Years*	1	6				
Beer or Ale at 6s. per *Bar. or under*	0	6	0	1	0	12. *Car.* II. 2. *Gul. & Mar.*
From Novemb. 17. 1691.	0	6				
Syder or Perry per *Hogſhead*	2	6	0	5	0	12. *Car.* II. 2. *Gul. & Mar.*
From Novemb. 17. 1691.	2	6				
Metheglin or Mead per *Gallon*	0	1	0	0	7	12. *Car.* II. 2. *Gul. & Mar.*
From Novemb. 17. 1691.	0	6				
Vineager made of Beer per *Barrel*	1	0	0	4	0	12. *Car.* II. 2. *Gul. & Mar.*
From Novemb. 17. 1691.	3	0				
Vineager made of Engliſh Materials other than from Beer			0	3	0	
Vineager made or mixed with Forreign Materials, or that hath paſſed through the Rape per *Barrel*			0	8	0	
Strong-Water or Aqua-Vitæ per *Gallon*			0	0	2	12. *Car.* II.
Low-Wines from Waſh, Tilts, or other Engliſh Materials, except Drink brewed of Malted Corn, Perry, and Syder per *Gallon*			0	1	0	2. *Gul. & Mar*
Low-Wines from Foreign, or any mixture with foreign Materials per *Gallon*			0	0	8	
Low-Wines from Syder, Perry, or any mixture therewith per *Gallon*			0	0	3.	

	Low-Wines from Drink made of malted Corn per *Gallon*	0 : 0 : 1

Note, the Duty of Syder and Perry is to be paid by the Retailer, all other Liquors by the Maker.

Liquors imported from beyond the Seas.

		l. s. d.	l. s. d.
12. *Car.* II. 2. *Gul.* & *Mar.*	*Beer, Ale, or Mum* per *Barrel* —	0 : 6 0	0 : 12 : 0
	From the 17th. *of* Novemb. 1691. —	0 : 6 0	
12. *Car.* II. 2. *Gul.* & *Mar.*	*Syder & Perry* per *Tun* —	0 : 10 : 0	8 : 10 : 0
	From the 17th. *of* Novemb. 1691.	8 : 00 : 0	
12. *Car.* II. 2 *Gul.* & *M.*	*Single Brandy or Spirits* per *Gallon*	0 : 00 : 4	0 : 04 : 4
	From November *the* 17th. 1691.	0 : 04 : 0	
12. *Car.* II. 2. *Gul.* & *Mar.*	*Brandy or Spirits above Proof* per *G.*	0 : 00 : 8	0 : 08 : 8
	From the 17th. *of* Novemb. 1691	0 : 08 : 0	
	Strong-Waters, Brandy, or Spirits brought from Guernsey, Jersey, Sark *and* Alderney *per Gallon* —	0 : 08 : 0	0 : 08 : 0

Note, that the Duty of all imported Liquors is to be paid by the Merchant, or Importer before Landing.

Note, that a Barrel of Vineager Beer is to contain 34 *Ale* or *Beer-Gallons*.

22 *Car.* II. *Chap.* 13. A Barrel of Vineager made of Syder, or any foreign Materials, or mixture therewith, or that hath run through the Rape, 31 $\frac{1}{2}$ *Gallons*.

And a Hogshead of Syder 63 *Wine-Gallons*.

Note, that the Additional Act for Excise upon Beer, Ale, *&c. Anno* 1. *Gul.* & *Mar.* granted for three years, commenced the 24th. of *July*, 1689. therefore the Rates therein given must be added to the aforesaid Rates from the 17*th.* of *November*, 1691. to the 24*th.* of *July* 1692. the said Act not till then expiring.

Appeals

12 *Car.* II. — from Chief Commissioners to be determined by Commissioners of Appeals, *p.* 18. 63.

— from Sub-Commissioners by the Justices at their next Quarter Sessions, whose Judgment shall be final. *p.* 19. 64.

25. *Car.* II. — not to be admitted till the single Duty be deposited with the Sub-Commissioners, and Security given for the Fine, if the Judgment be not reversed. *p.* 100.

— in

— in *London &c.* to be brought within two Months, in the Country within four Months next after the first Judgment, and notice left at the Offenders House, *p.* 104.

Brewers

— to enter weekly what Drink they brewed within that time, or forfeit for every Neglect 15*l.* *p.* 56. 51. 52. 12. *Car.* II.

— to pay within a Week after Entry, or forfeit double Duty, *p.* 7. 52.

— to enter, and pay at the next Market-Town, *p.* 7. 53.

— to permit the Gauger Entrance into their Brew-Houses, *&c.* to Gauge, *&c.* or forfeit 15*l.* and double the Duty of the Drink delivered out, *p.* 9. 55.

— convicted of false Entries lose their Allowances six Months, *p.* 33. 58.

— not to keep a private Storehouse, Tun, Back, Copper, *&c.* Penalty 50*l.* If in anothers House he also shall pay 50*l.* and the Vessels and Drink delivered to the Overseers for the Poors Use, *p.* 78. 151. 15. *Car.* II. 1. *Gul.* & *Mar.*

— to rectifie their Entries according to the Gauger's Returns within a Week, or otherwise discharge themselves, *p.* 84. 15. *Car.* II. 1. *Gul.* & *Mar.*

— not to carry out any Drink (without acquainting the Officer) from *March* the 25*th.* to *September* the 29*th.* but between Three in the Morning and Nine at Night. And from *September* the 29*th.* to *March* the 25*th.* but from Five in the Morning till Seven at Night, *p.* 89.

Nor to mix any small Drink or Worts with strong (without notice) after Gauge taken: nor conceal any Beer, Ale or Worts ungauged; Penalty in either Case 20*s. per* Barrel, *p.* 91. 152.

— Allowances for Wast by filling and Leakage within the Bills of Mortality are 3 in 23 Barrels of Beer, and 2 in 22 of Ale; out of the said Bills are 2 ½ in every 23 whether strong or small, *p.* 144. 1. *Gul.* & *Mar.*

— not to claim any Benefit of a Proviso in 15. *Car.* II. for rectifying their Entries (within a Week) according to the Gauger's Return, if they do not (*bona fide*) shew the Gauger all the Beer, Ale and Worts of every Guile for such time as the Copy of the Return was given, or if any other Act was done to defraud their Majesties of the Duty, *p.* 150, 151.

— not to use any Molossus, coarse Sugar, Honey, *&c.* on pain of forfeiting 100*l.* and the Goods, *p.* 157.

Barrel.

1. Gul. & Mar. —of Beer within the Bills of Mortality is to contain 36 Gallons, of Ale 32, of Beer or Ale out of the said Bills 34 Gallons, according to the *Ale-Quart* in the Exchequer.

12. Car. 2. All other Liquors according to the *Wine-Gallon* in *Guild-Hall, Lond. p.* 11. 56. 143, 144.

Brewing Vessels

25. Car. II. —to be Gauged by two *Artists* upon Oath, *p.* 84.

—not to be erected, altered or enlarged by Brewer or Retailer, and made use of, without notice given to the next Office of Excise, or to the Commissioners on pain of 50*l.* a Vessel, *p.* 77.

—by what Title soever claimed, or into whose hands soever they come are lyable to the Duty due from the Person who used them, and also to all Penalties by him incurr'd, *p.* 92.

Bribes not to be given or taken, Penalty 10*l.* apiece, *p.* 95, 96.

22. Car. II. **Chief Commissioners** to determine Offences in *London*, and within 10 Miles, *p.* 18. 63.

Certiorari not to supersede Execution of Justices Orders about Excise, *p.* 26. 72.

15. Car. II. **Colleges and Hall's** which brewed their own Drink, in their own Precincts, and sized it out there before the Acts of Excise not lyable to this Duty, *p.* 101.

Commissioners or Sub-Commissioners

12. Car. II. —may Depute Gaugers, *p.* 8. 53.

—may Compound with Retailers, &c. p. 15. 60.

—may (*if the Justices neglect* 14 *Days*) determine Offences in the Country, *p.* 19. 64.

Commissioners, Justices, and Sub-Commissioners

—upon any Complaint or Information to Summon the Offender, and upon his Appearance or Contempt to examine the matter of Fact, and upon Proof either by confession of the Party, or Oath of one or more credible Witnesses, to give Judgment, and issue out Warrants for Distress, which may be sold, if not redeemed in 14 dayes, rendring the overplus, and for want of sufficient

ſufficient Diſtreſs to impriſon the Offender till Satisfaction be made, *p.* 19. 65.

—may mitigate Fines at diſcretion, but not leſs than double Duty, beſides reaſonable Charges, *p.* 21. 66. 120. 1. *Gul. & Mar.*

—upon complaint made by a Brewer or Retailer of an Overcharge to examine the Witneſſes upon Oath on both ſides, and upon due Proof to acquit him of ſo much as ſhall be made out, *p.* 153.

Compounders brewing for other Perſons, or ſuffering it to be brewed in their Offices (without acquainting the Commiſſioners of the Quantity and Quality to be brewed, and for whom, and paying down the Exciſe) forfeit both Parties 5*l.* apiece, *p.* 93, 94. 15. *Car.* II.

Diſtillers

—lyable to the ſame Penalties for Non-entry, Non-payment, or Denial of Entrance as Retailers, *p.* 6. 7. 51, 52. 12. *Car.* II.

—not to remove Low-Wines after Gauge taken without diſtilling them a ſecond time, Penalty for every Gallon 5*s. p.* 141. 1. *Gul. & Mar.*

—denying the Gauger Entrance lyable to the Penalties in the former Acts tho Sale cannot be proved, *p.* 148.

—who draw Low-Wines, Spirits, or Brandy from malted Corn ſhall firſt brew it into clean and wholeſom Drink, and not mix it with other Materials, on pain of being charged with 12*d. per* Gallon, *p.* 2. *Gul. & Mar.*

—who draw Low-Wines, *&c.* from Corn ſhall not prepare, nor receive from any Perſon Waſh, Moloſſus, or other Materials, until he has diſtilled all his Liquor prepared from Corn, Penalty for every Barrel ſo found undiſtilled 5*l. p.*

—may ſhip off as Merchandize Spirits, or Brandy drawn from malted Corn (upon Oath made before two Commiſſioners of Exciſe, or Juſtices for that County or Place whence it is to be exported, that it is ſuch, and not mixed with other Materials, or with Low-Wines, Spirits, or Brandy drawn from other Materials, and that the Duty is paid; and that they are to be exported as Merchandize) and upon a Certificate from the Gauger of the Quantity ſhipt off, and that it was done in his Preſence; the Diſtiller ſhall draw back from the Commiſſioners or Collector 3*d. per* Gallon, *p.*

—not to ſet their Stills, nor deliver out any Low-Wines, Spirits, or *Aqua Vitæ*, in Caſk, or by the Gallon,

(without notice given to the Gauger for that Place or Division) from the 25th. of *March* to the 29th. of *September* but between Three in the Morning and Nine at Night, and from the 29th. of *Septemb.* to the 25th. of *March*, but from five in the Morning till Eight at Night, Penalty for every Offence 10 *l. p.*

Exported excisable Liquors (as *Beer, Ale, Syder, Mum*)

1. *Gul. & Mar.* —may be shipt off as Merchandize at the common Keys, within Excise-Hours, and in the presence of a Gauger, paying Custom 12*d.* per Tun, the Excise whereof is to be repaid by the Collector within a Month after Exportation, deducting 3*d.* per Tun for the Officer's Charges, *p.*

—not to be relanded, or put into any other Ship in these Dominions, on pain of forfeiting the Goods, and 50*l.* for every Cask, *p.*

—Custom-House Officers to charge the Master with so much Beer as the Ships Company may spend in their Voyage, *p.*

Mum imported to have no Defalcation upon Exportation, *p.* 115.

12. *Car.* II. 16 & 17. *Car.* II. **Fair Brewers** to pay the Duty before Sale, *p.* 14. 59.

Farmers may exercise all the Powers of Sub-Commissioners, except the judicial, *p.* 109.

Fines against

—12. *Car.* 2. are three Parts to the King, and one to the Informer, *p.* 21, 22. 67.

—15. *Car.* 2. are one Part to the King, one to the poor of the Parish, and one to the Informer. *p.* 163.

—2. *Gul. & Mar.* are half to the Informer, and half to the Informer. *p.* 157.

Gaugers

12. *Car.* II. —to enter by day alone, and by Night with any lawful Officer to Gauge all Beer, Ale, *&c. p.* 8. 54.

— Return to the Commissioners shall be a Charge on the Brewer or Retailer respectively, *p.* 9. 54.

—upon Denial of Entrance to forbid the Brewer or Retailer to sell or deliver out any more Drink, *p.* 10. 55.

12. & 15. *Car.* II. —to deliver to Brewers, or to some of their Servants Copies of their Charges weekly, after they have, or

ought

ought to have made their Entries, Penalty for every neglect 40 *s. p.* 9. 83.

—to take the Oath of their Office, and Oath of Obedience before the Justices, or one of the Barons of the Exchequer, which Oaths the Justices are to certifie to the next Quarter-Sessions there to be recorded, *p.* 23. 69. 12. *Car.* II. 1. *Gul.* & *Mar.*

—sued may plead the general Issue, and give this Act in Evidence, *p.* 26. 71. 12. *Car.* II. 15. *Car.* II.

—to take the Oaths, and Certificates thereof to be entred with the Auditor of Excise, on pain of 50*l* a Month, *p.* 105.

—missing any Worts, or finding that they are not Let fairly down, may charge so much Beer or Ale as such Worts would reasonably have made, *p.* 146. 1. *Gul.* & *Mar.*

——to return and charge warm Worts, allowing the Brewer or Retailer one tenth Part for Wash and Wast, *p.* 146.

——to leave Notes in writing with the Brewer or Retailer of the Quantity and Quality of their last Gauges, Penalty for every neglect 40*s. p.* 153.

——to certifie the Quantity of exported Liquors to the Commissioners, *p.*

——to keep an Account of all Liquors, Worts and Drink drawn from malted Corn, for making of Low-Wines, *&c.* and if they find any mixed with other Materials, to charge the Low-Wines with 12*d. per* Gallon, *p.* 2. *Gul.* & *Mar.*

——to take an Account of all Wash, and other Materials in any Back or Cask for making of Low-Wines, and also of all Low-Wines, Spirits, or strong-Waters in the Houses or Cellars of any maker of Low-Wines, *&c. p.*

——making Returns of Low-Wines from malted Corn, when drawn from other Materials shall lose their Employments, and forfeit for every Gallon so returned 10*s. p.*

Information or Complaint

——to be heard in the County, or Riding where the Offence was committed, *p.* 102. 15. *Car.* II.

——to be laid within three Months after the Offence done, and notice given to the Offender in writing, or left at his House, within a Week after it is laid, *p.* 156. 1. *Gul.* & *Mar.*

——against a Brewer for Non-entry, wilful false Entry, or Non-Payment, if by the Evidence it shall appear that

that any fraudulent Practices were uſed againſt their Majeſties Duty, then he ſhall incur all the Penalties inflicted by the 12. and 15. *Car.* 2. *p.* 151.

Inn-keepers, Victuallers and other Retailers

11. *Car.* II. ——to enter Monthly what Beer or Ale they brewed within that time on pain of 10*l. per* Month for Inn-keepers, and 40*s.* for Victuallers, *p.* 6. 51.

——to pay within a Month after Entry, or forfeit double Duty, *p.* 7. 52.

——to ſuffer the Gauger to enter, or forfeit 15*l.* and double the Duty of the Drink carried out, *p.* 9. 55.

15. *Car.* II. 1. *Gul. & Mar.* ——not to keep any private Store-houſe, Tun, *&c.* Penalty 50*l.* and if in any other Perſon's houſe, He ſhall pay 50*l.* and the Veſſels and Drink given to the poor. *p.* 78. 151.

Nor to mix any ſmall Drink or Worts with ſtrong (without notice) after Gauge taken, nor conceal any Drink or Worts not Gauged, Penalty in either Caſe, 20*s per* Barrel, *p.* 91. 152.

——uſing any Moloſſus, Coarſe Sugars, Honey, *&c.* forfeit 100*l.* and the Goods, *p.* 157.

Imported excisable Liquors

12. *Car.* II. —not to be Landed till the Duty be paid, *p.* 5. 50.

15. *Car.* II. —not to be Landed before Entry, the Duty paid, and Warrant for Landing ſigned by the Gauger, or elſe Landed in his Preſence on pain of forfeiting the Goods, *p.* 98.

——coming by Coaſt-Cocquet, Tranſire, or Certificate, (except Beer, Ale, Syder, Perry and Metheglin) not to be Landed before Entry, Penalty double the value of the Liquors, *p.* 99.

2. *Gul. & Mar.* —— brought from *Guernſey*, *Jerſey*, *Sark* or *Aldernay*, not particularly charged with any Duty, to pay the ſame as the like Liquors made in *England*, the Duty of all to be paid to the Collector, or Officer of Exciſe upon Entry, and before Landing, and Oath to be made by the Owner or Importer before the Collector of the Cuſtoms for the Port where they are to be Landed, that they are of the growth of the ſaid Iſlands, and not made, or mixed with foreign Materials; otherwiſe they ſhall be taken as the Growth of *France*, and deſtroyed, and all Perſons concerned in the Importation or Sale ſhall be lyable to the Penalties in the Act *An.* 1. *Gul. & Mar.* prohibiting all Trade and Commerce with *France*, *p.*

Juſtices

Juſtices of the Peace to meet monthly, or oftner if occaſion to hear and determine Offences againſt the Laws of Exciſe, *p.* 103. 15. *Car.* II.

Office

——to be held in *London*, or within ten Miles, to which all others are accountable, *p.* 24. 69. 12. *Car.* II.

——to be kept in every Market-Town on every Market-Day from Nine to Twelve, and from Two till Five, Penalty for every neglect 10*l.* *p.* 87, 88. 15. *Car.* II.

Summons left at the Offender's Houſe, or uſual place of Reſidence, or with his Wife, Child, or menial Servant, ſhall be accounted as good a Summons as if it had been delivered to his own hands, *p.* 107.

The Salisbury Cafe:

At the Court at *Whitehall* the 23*d.* of *April*, 1669.

PRESENT

The KING'S moſt excellent Majeſty,

Hi Ro al High.	*Duke of York*	*Lord Arlington*
His Highneſs	*Prince Rupert*	*Lord Newport*
	Lord Keeper	*Lord Berkly*
	Duke of Ormond	*Lord Aſhley*
	Marq. of Dorcheſter	*Mr. Treaſurer*
	Lord Chamberlain	*Mr. Vice-Chamberlain*
	Earl of Bridgwater	*Mr. Secr. Trevor*
	Earl of Bath	*Mr. Chanc. of Dutchy*
	Earl of Craven	*Sir John Duncombe.*
	Earl of Lauderdale	

THE Cauſe upon the Complaint of the Farmer of his Majeſty's Duty of Exciſe in the County of *Wilts* againſt ſeveral Juſtices of the Peace of the City of *New Sarum* having been heard before the Right Honourable the Lords Commiſſioners of his Majeſty's Treaſury, and by their Lordſhips reported to this Board: And according to order both ſides with their Council learned attended this day, and the whole Matter being heard at large, it did appear that divers Complaints having been made to the ſaid Juſtices by the Officers of Exciſe againſt ſeveral

several Brewers for false Entries and other fraudulent Practices against his Majesty's said Duty, the said Justices neither regarding the Returns of the sworn Gaugers, nor the Entries of the Brewers did give many erroneous Judgments not agreeable to Justice, or the Laws of Excise, by which Practice the King's said Revenue was very much damaged, and the Farmers and Officers discouraged: Upon consideration whereof, and upon reading the humble Petition of the said Justices acknowledging their Offences, imploring his Majesty's Mercy and Pardon, and alledging their said Errors to have proceeded from want of well understanding the Acts of Excise, and not from any Corruption or dissatisfaction to his Majesty's Service, and promising all due Obedience and Conformity to such Rules concerning Excise as by this Board, or by his Majesty's Council learned should be communicated to them in that behalf; It was therefore thought fit, and ordered accordingly (his Majesty present in Council) that the Right Honourable the Lord Keeper of the great Seal of *England* do (upon Application of the said Farmer) issue out a Commission of Association in usual Form under the great Seal of *England* to such of his Majesty's Justices of the Peace of the said County, as his Lordship shall conceive most proper and fit, to have equal Jurisdiction with the Justices of the said Corporation: And to prevent such erroneous Judgments and Proceedings in this Branch of his Majesty's Revenue for the future the Justices are to observe the *Rules* and *Directions* following, *viz.*

I. That when any matter of difficulty occurs to them in the Practice or exposition of the Acts concerning Excise, they represent the same to the Lords Commissioners of his Majesty's Treasury, or advise with some of his Majesty's learned Council, that so they may not preingage themselves, nor prepossess the Country with any Opinion contrary to his Majesties Intereſt, and the true meaning of the Acts of Parliament.

II. That upon Information against a Brewer for any Default, the Gaugers are not only sufficient, but the most proper Witnesses for the King, and especially in those things where they depose as Gaugers; for their Return is such a Charge upon a Brewer both for Quantity and Quality as is in all Particulars binding, and not to be varied from:

And

And the Juſtices of Peace ought in all Caſes where Forfeitures are impoſed by the Act, to give Judgment and Sentence upon the Gauger's Evidence.

III. That Brewers ought not to make any mixture of Drink, after an Account hath been taken by the Gauger, unleſs it be in his Preſence, or upon notice given him; if they do they incur a poſitive Forfeiture by the Act; and if the Brewer make not his Entry that Week wherein he hath brewed, he incurs a Penalty by default: And if his Entry be not rectified according to the Return of the Gauger, within one Week after the Delivery of the Copy of the ſaid Return, he alſo incurs another Penalty by the Act; and no ſubſequent Entries, nor Payment of Duty excuſes from any of the Forfeitures.

IV. The Gauger may go into any Brewhouſe at any time by day without a Conſtable, and by night with a Conſtable, and any Refuſal or Delay or Excuſe equivalent to a Refuſal is punihable, and no Entry or Payment after ſuch Refuſal exempts from the ſeveral Forfeitures of Fifteen Pounds, and Twenty Shillings for every Barrel he hides from the Gauger's ſight: And in theſe Caſes it will become the Farmer, and his Officers to be very watchful, and the Juſtices Countenance to them will be very requiſite, for a little time will ſerve men who deſign Fraud for great Advantage.

V. All Fines levied by the Juſtices upon Complaint for matters concerning Exciſe muſt be paid immediately to the Farmer, or Proſecutor, and on the King's behalf, (except ſuch part as is by Law proportioned, and allowed to the poor) and he, and not they, is the proper Accountant to the King: neither is it in their Power in the Caſe of Forfeitures to omit Judgment according to the Letter of the Act, nor is any thing of Equity in their Power, otherwiſe than to mitigate ſome Fines in which the Act gives particular Direction.

VI. That the Juſtices inform themſelves throughly of the Acts of Exciſe, that ſo they may with the more eaſe to themſelves, and Satisfaction to his Majeſty adminiſter Juſtice indifferently both to the Farmer and Brewers, and that his Majeſty's Farmers and Officers have all due encouragement and Countenance.

VII. The Allowances given to the Brewers by the Acts are to be made out of the Quantities and Qualities in the Gauger's Returns, and not in the Brewers Entries, unleſs agreeing with the Gauger's Returns. Which

Which *Rules* and *Directions* being read at the Board (his Majesty present in Council) were allowed of and approved, and it was ordered that as well his Majesty's Justices of the Peace of the City of *New Sarum* in the County of *Wilts*, as all other Justices of the Peace within the Kingdom of *England*, Dominion of *Wales*, and Town of *Berwick* upon *Tweed*, do truly and punctually observe the same.

And it was further ordered, that the Clerk of the Council attending do from time to time issue out Transcripts of this Order under the Council-Seal to such of the Farmers of the Excise as shall desire the same, who are required to deliver them to the Justices of the Peace in the respective Counties and Places in order to the better management of his Majesty's said Revenue, and prevention of all Inconveniences by misunderstanding the said Acts of Excise.

FINIS.

ERRATA.

PAge 8. line 14. read 3*aae*.
p. 10. l. 2. r. *aaaa*$=d$.
$d-eeee$
p. 13. at the end of *Prob.* X. insert
☞ *Or by Segments of a Circle.*

CD	:	Radius	::	CE	:	V.S$=$Segm.
28.37	:	100	::	8.5	:	.2933$=$.2443

And Area 6.345 × .2443$=$HCI 1.551 *A. G.*
p. 16. l. 2. r. 25. in the Table of the Frustums of a *Cone*, put three Cyphers before the 3*d. Diff.*
In that for the Frustums of a *Parabolick Spindle* and *Spheroid* place two Cyphers before the 3*d. Diff.*
p. 24. l. 35. r. 585.42
p. 31. at the end of *Prob.* XLVIII. insert

And √AE × EB	:	AK	::	HI	:	CD
32.55	:	41.045	::	23	:	29

p. 36. l. 34. And Diameter CD 29 × .2931$=$CG 8.5